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Proposed Best Demonstrated Available Technology (BDAT) Background Document for Characteristic Ignitable Wastes (D001) Characteristic Corrosive Wastes (D002), Characteristic Reactive Wastes (D003), and P and U Wastes Containing Reactive Listing Constituents. Volume 2

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PROPOSED

BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) BACKGROUND DOCUMENT FOR CHARACTERISTIC IGNITABLE WASTES (D001), CHARACTERISTIC CORROSIVE WASTES (D002), CHARACTERISTIC REACTIVE WASTES (D003), AND P AND U WASTES CONTAINING REACTIVE LISTING CONSTITUENTS

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EXECUTIVE SUMMARY

The Hazardous and Solid Waste Amendments Act (HSWA), enacted on November 8, 1984, amended the Resource Conservation and Recovery Act (RCRA) of 1976. Pursuant to HSWA, section 3004(g) of RCRA requires the U.S. Environmental Protection Agency (EPA) to promulgate regulations that restrict the land disposal of hazardous wastes beyond specified dates. Under section 3004(m) of RCRA, the Agency is required to set "levels or methods of treatment, if any, which substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized." As specified in the promulgated regulatory framework for implementing the land disposal restrictions, these "treatment standards" are based on the performance of the best demonstrated available technology (BDAT) for a waste.

Consistent with section 3004(m) of RCRA, EPA is proposing treatment standards based on the best demonstrated available technology (BDAT) for characteristic ignitable wastes (D001), characteristic corrosive wastes (D002), characteristic reactive wastes (D003), and P and U wastes containing reactive listing constituents. Compliance with these BDAT treatment standards is a prerequisite for the placement of these wastes in units designated as land disposal facilities.

Wastes that are hazardous because they exhibit a hazardous characteristic are no longer considered hazardous if they are treated so that they no longer exhibit any of the characteristics. It is important to point out that treatment of any ignitable, corrosive, or reactive wastes must remove all of the hazardous characteristics of the waste. For example, ash residues from the incineration of an ignitable waste will no longer be ignitable, but may exhibit the characteristic of EP toxicity for metals (because the metals concentrate in the ash) even though the waste may not have been EP toxic prior to incineration; this residue may therefore require further treatment. Note that if the characteristic waste or the residual is mixed with a listed hazardous waste, it is considered to be a hazardous waste even if treated to remove all characteristics, and it must meet any standards set for the listed hazardous waste.

EPA may establish treatment standards either as a specific treatment technology or as a performance level of treatment monitored by measuring the concentration levels of the hazardous constituents in the waste, treatment residual, or extract of the waste. EPA prefers to establish treatment standards as performance levels; however, because of the diversity of constituents present in wastes that can be classified as D001, D002, and D003, the Agency has been unable to identify a list of constituents that could be used to regulate these wastes. In addition, there are no EPA-approved analytical methods for most of the P and U reactive listing constituents. Therefore, EPA is proposing specific treatment technologies as BDAT treatment standards for D001, D002, some subcategories of D003, and P and U wastes containing reactive listing constituents. For the D003 Reactive Cyanide Subcategory waste code, EPA is proposing performance level treatment standards for cyanide in wastewaters and nonwastewaters, since this BDAT list constituent is consistently present at treatable concentrations in the waste and treatment performance data and analytical methods are available for this constituent.

Because of the nature of the subcategories of these D001, D002, or D003 wastes, the Agency is not distinguishing wastewater versus nonwastewater standards in all cases. Sometimes this is because there is no way to physically distinguish one from the other (e.g., D001 compressed gases are neither wastewaters nor nonwastewaters), or sometimes it is prudent to apply the same technology to both wastewaters and nonwastewaters. In other cases, only nonwastewater or only wastewater standards are proposed for subcategories of these characteristic wastes. For the purpose of determining the applicability of the treatment standards, wastewaters are defined as wastes containing less than 1 percent (weight basis) total suspended solids* and less than 1 percent (weight basis) total organic carbon (TOC). Wastes not meeting this definition must comply with the treatment standards for nonwastewaters.

EPA has determined that wastes defined as D001 represent four treatability groups based on chemical and physical composition: the Ignitable Liquids Subcategory, the Ignitable Compressed Gases Subcategory, the Ignitable Reactives Subcategory, and the Oxidizers Subcategory. Treatment standards for all D001 wastes are presented in Table 1 at the end of this section.

The Agency has determined that D002 wastes may belong to an Acid Subcategory, Alkaline Subcategory, or an Other Corrosives Subcategory. Treatment standards for the D002 subcategories are shown in Table 2.

For D003, EPA has concluded that there are five treatability groups: Reactive Cyanides Subcategory, Reactive Sulfides Subcategory, Explosives Subcategory, Water Reactives Subcategory, and Other Reactives Subcategory. Table 3 presents treatment standards for the five D003 subcategories.

The Agency has determined that wastes with reactive P and U listing constituents can be divided into four treatability groups: incinerable reactive organic and hydrazine derivatives, other incinerable inorganics, fluorine compounds, and recoverable metallics. Shown in Table 4 are the treatment standards for the P and U wastes containing reactive listing constituents.

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* The term "total suspended solids" (TSS) clarified EPA's previously used terminology of "total solids" and "filterable solids." Specifically, total suspended solids is measured by Method 209c (Total Suspended Solids Dried at 103 to 105°C) in Standard Methods for the Examination of Water and Wastewater, 16th Edition (APHA, AWWA, and WPCF 1985).

This background document presents the Agency's technical support for selecting and developing the treatment standards for D001, D002, D003, and P and U wastes containing reactive listing constituents. It is organized into five chapters. Each chapter is arranged in four sections, with the exception of the reference chapter. Section 1 of each chapter presents waste-specific information such as the waste-generating processes and waste characterization. The industries that will be affected by the land disposal restrictions for the specific characteristic waste are described in Section 2. The applicable technologies that can be used to treat the waste are discussed in Section 3. Section 4 identifies the best demonstrated available technology.

The BDAT program and EPA's promulgated methodology are more thoroughly described in two additional documents: Methodology for Developing BDAT Treatment Standards (USEPA 1988a) and Generic Quality Assurance Project Plan for Land Disposal Restrictions Programs (BDAT) (USEPA 1987a). The petition process to be followed in requesting a variance from the BDAT treatment standards is discussed in the methodology document.

TABLE 1 BDAT TREATMENT STANDARDS FOR D001

IGNITABLE LIQUIDS SUBCATEGORY
BASED ON 261.21(a)(1)

INCINERATION, FUEL SUBSTITUTION,*
OR RECOVERY AS METHODS OF TREATMENT

IGNITABLE COMPRESSED GASES SUBCATEGORY
BASED ON 261.21(a)(3)

RECOVERY OR INCINERATION* OF VENTED** IGNITABLE
GASES AS METHODS OF TREATMENT

IGNITABLE REACTIVES SUBCATEGORY
BASED ON 261.21(a)(2)

DEACTIVATION AS A METHOD OF TREATMENT

OXIDIZERS SUBCATEGORY
BASED ON 261.21(a)(4)

DEACTIVATION AS A METHOD OF TREATMENT

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* - Incinerators must comply with 40 CFR, 264 Subpart 0 or 265 Subpart 0. Fuel substitution units must be in compliance with 40 CFR Part 266 Subpart D.

** - Ignitable gases may be vented directly into an incinerator or vented into a suitable adsorbent prior to incineration. Although the gases, once vented, are no longer compressed in a cylinder, the Agency does not consider that treatment has occurred until the ignitable gas has been incinerated. Adsorption of the ignitable gas into either a solid or liquid adsorbent is typically a reversible physical process. Thus, the ignitable chemical has not been destroyed.

TABLE 2 BDAT TREATMENT STANDARDS FOR D002
ACID SUBCATEGORY
261.22(a)(1)

NEUTRALIZATION WITH BASES TO: 6< pH <9 AS INSOLUBLE SALTS OR RECOVERY AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR D002
ALKALINE SUBCATEGORY
261.22(a)(1)

NEUTRALIZATION WITH ACIDS TO: 6< pH <9 AS INSOLUBLE SALTS OR RECOVERY AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR D002
OTHER CORROSIVES
261.22(a)2

DEACTIVATION TO: SAE 1020 STEEL CORROSION RATE <6.35 mm/yr AS A METHOD OF TREATMENT

TABLE 3 BDAT TREATMENT STANDARDS FOR D003

REACTIVE CYANIDES SUBCATEGORY
BASED ON 261.23(a)(5)
[Nonwastewaters]

Regulated Constituent	Maximum for any Single Grab Sample Total Composition (mg/kg)
Cyanides (Total)	110
Cyanides (Amenable)	9.1

REACTIVE CYANIDES SUBCATEGORY
BASED ON 261.23(a)(5)
[Wastewaters]

Regulated Constituent	Maximum for any Single Grab Sample Total Composition (mg/l)
Cyanides (Total)	1.9
Cyanides (Amenable)	0.10

REACTIVE SULFIDES SUBCATEGORY
BASED ON 261.23(a)(5)

ALKALINE CHLORINATION, CHEMICAL OXIDATION, OR INCINERATION* FOLLOWED BY PRECIPITATION TO INSOLUBLE SULFATES AS METHODS OF TREATMENT

EXPLOSIVES, WATER REACTIVES, AND OTHER REACTIVES SUBCATEGORIES
BASED ON 261.23(a)(6), 261.23(a)(2) THROUGH (4), AND 261.23(a)(1), RESPECTIVELY

DEACTIVATION AS A METHOD OF TREATMENT

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* - Incinerators must comply with 40 CFR 264 Subpart O or 265 Subpart O.

TABLE 4 BDAT TREATMENT STANDARDS FOR P AND U WASTES CONTAINING REACTIVE LISTING CONSTITUENTS

BDAT TREATMENT STANDARDS FOR P009, P068, P081, P112, U023, U086, U096, U098, U099, U103, U109, U133, AND U160

[Wastewaters]

INCINERATION* OR CARBON ADSORPTION AS A METHOD

BDAT TREATMENT STANDARDS FOR P009, P068, P081, P112, U023, U086, U096, U098, U099, U103, U109, U133, AND U160

[Nonwastewaters]

THERMAL DESTRUCTION AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR P006, P096, P105, P122, U135, U189, AND U249

[Wastewaters]

CHEMICAL OXIDATION FOLLOWED BY PRECIPITATION TO INSOLUBLE SALTS AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR P006, P096, P105, P122, U135, U189, AND U249

[Nonwastewaters]

THERMAL DESTRUCTION AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR P056 AND U134

[Nonwastewaters and Wastewaters]

SOLUBILIZATION IN WATER FOLLOWED BY PRECIPITATION AS CALCIUM FLUORIDE; OR RECOVERY AS METHODS OF TREATMENT

BDAT TREATMENT STANDARDS FOR P015, P073, AND P087

[Nonwastewaters and Wastewaters]

RECOVERY AS A METHOD OF TREATMENT

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* - Incinerators must comply with 40 CFR 264 Subpart O or 265 Subpart O.

1. CHARACTERISTIC IGNITABLE WASTES (D001)

According to 40 CFR 261.21, there are four criteria for defining a waste as a D001 Ignitable Waste. Paraphrasing these criteria, a waste can be a D001 waste if (1) it is a liquid with a flash point less than 140°F; (2) it is an ignitable compressed gas; (3) it is not a liquid and is capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burns vigorously and persistently; or (4) it is an oxidizer.

Although some D001 wastes may exhibit characteristics of more than one criterion, EPA determined that these four criteria translate directly into four treatability groups for D001 wastes. The first treatability group is classified as the Ignitable Liquids Subcategory. The second treatability group is classified as the Ignitable Compressed Gases Subcategory. The third treatability group is classified as the Ignitable Reactives Subcategory. The fourth treatability group is classified as the Oxidizers Subcategory.

1.1 Waste Characterization

Because of the variation of wastes classified as D001, it is not possible to characterize every individual D001 waste stream. Therefore, the Agency based its BDAT development for D001 wastes on a generalization of waste characterization for each subcategory listed above. Tables A-1 and A-2 in Appendix A present some waste characterization for the RCRA-permitted facilities that generated D001 wastes and D001 wastes mixed with other RCRA-listed and characteristic wastes, respectively. This information has been gathered from the 1986 National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR Survey); confidential business information is not included.

1.1.1 Ignitable Liquids Subcategory

These wastes are liquids that at a temperature, referred to as the flash point, of 140°F or less give off a vapor sufficient to form an ignitable mixture with the air near the surface of the liquid or containment vessel. For the purposes of the official shipping regulations, the flash point is determined by the Tagliabue open-cup method (ASTM D1310-63).

The majority of all D001 wastes generated can be identified as ignitable liquids. Most of these ignitable liquid wastes are primarily organic liquids. The major organic constituents in these wastes are volatile, flammable hydrocarbons or oxygenated hydrocarbons that provide the characteristics of ignitability to the waste (i.e., a flash point of less than 140°F). Some D001 Ignitable Liquids have been shown to contain organic constituents that are also constituents in F001-F005 waste solvents. These constituents include the following:

Acetone
n-Butyl alcohol
Carbon disulfide
Carbon tetrachloride
Chlorinated fluorocarbons
Chlorobenzene
Cresols
Cresylic acid
Cyclohexanone
1,2-Dichlorobenzene
Ethyl acetate
Ethyl ether
Ethylbenzene
Isobutanol
Methanol
Methyl ethyl ketone
Methyl isobutyl ketone
Methylene chloride
Nitrobenzene
Pyridine
Tetrachloroethylene
Toluene
Trichloroethylene
1,1,1-Trichloroethane
1,1,2-Trichloro-1,2,2-trifluoroethane
Trichlorofluoromethane
Xylene

Other wastes in the subcategory may contain unlisted solvents, paint thinners, degreasing compounds, byproduct liquids, contaminated oils, petroleum distillates, lacquers, varnishes, and contaminated fuels. The characterization data for wastes in this subcategory are shown on Table A-3 located in Appendix A.

1.1.2 Ignitable Compressed Gases Subcategory

D001 wastes in the Ignitable Compressed Gases Subcategory are those wastes that meet the definition of an ignitable compressed gas according to 49 CFR 173.300. By definition, the term "ignitable compressed gas" designates (1) any material or mixture having in the container an absolute pressure exceeding 40 psi at 70°F or, regardless of the pressure at 70°F, having an absolute pressure exceeding 104 psi at 130°F, or (2) any liquid flammable material having a vapor pressure exceeding 40 psi at 100°F as determined by ASTM Test D-323. For each of the above cases, any one of the following must also occur:

1. Either a mixture of 13 percent or less (by volume) with air forms a flammable mixture or the flammable range with air is wider than 12 percent, regardless of the lower limit. These limits should be determined at atmospheric temperature and pressure. The method of sampling and test procedures must be acceptable to the Bureau of Explosives and approved by the Director, OHMT.
2. Using the Bureau of Explosives' Flame Projection Apparatus,* the flame projects more than 18 inches beyond the ignition source with valve opened fully, or the flame flashes back and burns at the valve with any degree of valve opening.
3. Using the Bureau of Explosives' Open Drum Apparatus,* there is any significant propagation of flame away from the ignition source.
4. Using the Bureau of Explosives' Closed Drum Apparatus,* there is any explosion of the vapor-air mixture in the drum.

The physical characteristics of wastes in this subcategory could be described as a discarded cylinder containing the compressed gas. The Agency believes that generators of byproduct gaseous wastes generated during a process generally flare these gases to destroy them and do not place the waste gases in containers. Therefore, the majority of these waste containers will probably be empty containers containing gas residues of the containerized gases that were used in a process, rather than generated during a process. Containerized gases that might be used in a process and disposed of in a container would include acetone, oxygen, methane, and hydrogen.

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* A description of the Bureau of Explosives' Flame Projection Apparatus, Open Drum Apparatus, Closed Drum Apparatus, and method tests can be obtained from the Bureau of Explosives.

1.1.3 Ignitable Reactives Subcategory

By definition in 40 CFR, these nonliquid wastes are capable of causing fire through friction, absorption of moisture, or spontaneous chemical change. Furthermore, when these wastes are ignited, they burn vigorously and persistently. Based on these physical waste descriptions, there appears to be an overlap of this D001 subcategory with certain D003 reactive wastes. However, a close examination of the definitions in 261.21(a)(2) for ignitable wastes and 261.23(a)(2), (3), and (6) for reactive wastes reveals the distinction. The key difference is found in the phrase for ignitable wastes "...when ignited, burns vigorously and persistently." This phrase implies that the hazard is due primarily to the ignition potential rather than to the extreme reactivity.

D001 Ignitable Reactives are generated on a sporadic basis and generally in low volumes. These wastes are primarily inorganic nonwastewaters or other wastes containing reactive materials. Ignitable reactives include materials such as reactive alkali metals or metaloids (such as sodium and potassium) and carbide slags. These wastes are very reactive with water and can ignite because of the generation of gases and heat from the reaction with water. Other ignitable solids in this subcategory include metals such as magnesium and aluminum that, when finely divided, can vigorously react with oxygen in the air if they are ignited under certain conditions. Zirconium fines that are pyrophonic (i.e., that cause fire through friction) have also been included in this D001 subcategory.

1.1.4 Oxidizers Subcategory

These wastes must meet the definition of an oxidizer according to 49 CFR 173.151, which says "an oxidizer is a substance such as a chlorate, permanganate, inorganic peroxide, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter." D001 wastes in the Oxidizers Subcategory are primarily inorganic. These include wastes such as waste nitrates, peroxides, perchlorates, and permanganates. The available characterization data for the Oxidizers Subcategory are shown on Table A-4 located in Appendix A.

1.2 Industries Affected

Because of the diversity of industries generating D001 wastes, the Agency will not attempt to describe every industry that generates characteristic ignitable wastes. The following are brief summaries describing by subcategory the industries that will be most affected by the land disposal ban of D001 wastes. Tables A-1 and A-2 in Appendix A present industrial descriptions for RCRA-permitted facilities that generate D001 wastes and D001 wastes mixed with other RCRA-listed wastes, respectively.

1.2.1 Ignitable Liquids Subcategory

As stated previously, the majority of all D001 wastes that are generated can be identified as ignitable liquids. These wastes are generated by almost every industry and represent a significant proportion of all hazardous wastes. They include wastes such as solvents, degreasing compounds, and byproduct liquids, i.e., wastes that can be generated by most industries. Industries generating D001 Ignitable Liquids include: petroleum refining, producers of plastics and resins, paints and allied products, plating and polishing, motor vehicle parts and accessories, electronic equipment, agricultural chemicals, wood household furniture, pressed and blown glass, and commercial printing (USEPA 1988e).

1.2.2 Ignitable Compressed Gases Subcategory

The chemicals industry uses compressed gases as reactants in chemical processes. Additionally, many industries use containerized gases for heating and welding purposes. The Agency has identified only three generators of gases classified as D001 wastes. The standard industrial classifications (SIC) for the generators are manufacturing industries, conveyors and conveying machinery, and general chemical manufacturing (USEPA 1988e).

1.2.3 Ignitable Reactives Subcategory

The chemicals industry, specifically the nonferrous metals chemicals industry, generates most of the wastes in this subcategory. The Agency has identified only three facilities as potential generators of wastes in the D001 Ignitable Reactives Subcategory. The industries include producers of semiconductors and related devices, producers of power driven hand tools. and the Department of Energy (USEPA 1988e).

1.2.4 Oxidizers Subcategory

Most of these wastes are generated by the chemicals industry as spent oxidizing solutions or byproducts. The Agency has information indicating that the Department of Defense generates D001 Oxidizer Wastes from treatment by open burning or open detonation of waste propellants. Other potential generators for these wastes include the chemicals and allied products industries and manufacturers of fertilizers.

1.3 Applicable/Demonstrated Technologies

This section describes the applicable and demonstrated treatment technologies pertinent to the treatment of D001 wastes and current management practices for these wastes. To be applicable, a technology must theoretically be usable to treat the waste in question or a similar waste. To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or of a similar waste.

Most generators of D001 wastes are currently performing some form of treatment, since ignitable wastes are already restricted from placement in surface impoundments, waste piles, land treatment units, and landfills according to 40 CFR 264.229, 264.256, 264.281, and 264.312, respectively. The following is paraphrased from the Code of Federal Regulations (CFR) for disposal requirements for ignitable wastes:

> Ignitable waste must not be placed in a surface impoundment, waste pile, land treatment unit, or landfill, unless the following conditions are met:
>
> - The waste is treated, rendered, or mixed before or immediately after placement in the impoundment so that the resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable waste.
> - The owner or operator of a facility that treats, stores, or disposes of ignitable waste takes precautions to prevent reactions that generate extreme heat or pressure, fire or explosions, or violent reactions; produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment; produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions; damage the structural integrity of the device or facility; or threaten human health or the environment through other like means.

- The waste is managed in such a way that it is protected from any material or conditions that may cause it to ignite or react.

In addition, a surface impoundment can be used to dispose of ignitable wastes solely for emergencies. Also, ignitable wastes in containers may be landfilled without meeting the above criteria if the wastes are disposed of in such a way that they are protected from any material or conditions that may cause them to ignite. At a minimum, ignitable wastes must be disposed of in nonleaking containers that are carefully handled and placed so as to avoid heat, sparks, rupture, or any other condition that might cause ignition of the wastes; must be covered daily with soil or other noncombustible material to minimize the potential for ignition of the wastes; and must not be disposed of in cells that contain or will contain other wastes that may generate heat sufficient to cause ignition of the waste.

1.3.1 Ignitable Liquids Subcategory

All wastes in the Ignitable Liquids Subcategory are defined as hazardous because of a low flash point that is due directly to the chemical and physical properties of the organics in the waste. These wastes also have a high heating value.

One might assume that it does not matter how the ignitability characteristic is removed so long as the waste ends up nonignitable. Ignitability, however, reflects presence of volatile organic compounds (VOC), which are ozone precursors. If the ignitable wastes are diluted, VOC will ordinarily be emitted in concentrations far exceeding those emitted by treatment processes in which these volatiles are destroyed. Control of VOC is a legitimate concern under RCRA (section 3004 (m)) specifically calls for minimizing threats to the environment as well as to human health, and the Agency has specifically called attention to control of VOC in the 1987 proposed rule implementing RCRA section 3004 (m). Volatile emissions from dilution also may pose a reignition hazard. Dilution of ignitable wastes fails to utilize the wastes' energy value, contravening a fundamental RCRA goal of encouraging recovery of energy from wastes (RCRA section 1002 (d)). EPA also believes that allowing dilution of D001 wastes will create an incentive for generators to miscode the listed, prohibited solvent wastes (F001-F005) as D001 wastes, frustrating the treatment requirements for those wastes. Accordingly, the Agency believes that dilution is not an applicable method for treating ignitable wastes.

The applicable technologies that the Agency has identified for treatment of wastes in the Ignitable Liquids Subcategory are incineration, fuel substitution (because of their high heating value) and recovery. Any thermal treatment technology, such as incineration, will completely remove the characteristic of low flash point by destroying the organics, thereby rendering the waste nonignitable. Fuel substitution, like incineration, destroys the organic constituents in the waste. In fuel substitution, however, fuel value is also derived from the waste. Recovery technologies such as distillation and solvent extraction can be used to separate and recover components. Although recovery technologies can recover some components for reuse, often these processes generate residues that may still exhibit the characteristic of ignitability and require further treatment prior to land disposal.

The Agency believes that all the applicable technologies for organics treatment are demonstrated to treat the D001 Ignitable Liquids Subcategory since they are currently used to treat such wastes. The Agency has data showing that 26 percent of D001 Ignitable Liquids are already treated by incineration, 25 percent are used as a fuel substitute, and 24 percent are recovered for reuse through processes such as distillation (USEPA 1989d).

1.3.2 Ignitable Compressed Gases Subcategory

The Agency thinks it unlikely that ignitable compressed gas wastes require placement in any type of land disposal unit. The Agency believes that no gas cylinders containing compressed ignitable gases are placed in surface impoundments, and that it is physically impossible to deep-well inject these wastes. The Agency recognizes, however, that some D001 cylinders containing compressed ignitable gases may be placed in waste piles. The Agency expects such placement to be temporary since these cylinders are usually returned to distribution facilities to be refilled. The Agency does not intend to prevent short-term storage of cylinders containing ignitable compressed gases (e.g., acetylene, hydrogen).

The Agency has identified reuse/recovery of the contents of the cylinder or incineration of the contents as theoretically applicable technologies to all wastes in this category. For compressed gases or low boiling liquids in cylinders, recovery consists of connecting one or more cylinders containing a given gas to a vacuum pump or to the suction side of a compressor. The cylinder is thereby evacuated, and the recovered gas may be stored in a compressed gas tank or as a low-boiling liquid in a closed tank system. The compound can then be transferred to a container to be shipped for reuse by a customer, or it can be reprocessed and purified in the plant prior to repackaging. However, no single recovery system will serve to recover more than one gas at a time in order to avoid contamination. Furthermore, assuming that a compression step is necessary for recovery, then different equipment will be required for gases that remain gaseous during compression as compared to those gases that readily liquify. Recovery by refilling the cylinders for reuse is practiced by many facilities using containerized gases in their processes. Consequently, EPA believes this technology to be demonstrated. In addition, the Agency has established a policy that facilities that manufacture gases do not have to be considered treatment, storage, or disposal facilities (TSDFs) in order to directly refill compressed gas cylinders.

The second applicable technology, incineration, would provide thermal oxidation or thermal reduction of compounds present in the waste gases. Thermal oxidation would apply to those gases that are essentially hydrocarbons or derived from hydrocarbons. Thermal reduction is a term that describes combustion in a condition that is, at least initially, a "starved air" condition. "Starved air" means combustion with less than the stoichiometric amount of oxygen. Thermal reduction is a well-known mode for burning or incinerating nitrogen-containing fuels or wastes to ensure that the organically bound nitrogen is converted to elemental nitrogen rather than nitrogen oxide(s). The gas would have to be vented directly into an incinerator or vented into an appropriate adsorbent material (provided that air emissions can be controlled), followed by incineration of the adsorbed gas/adsorbent material combination. The problem with adsorption as an approach is that the toxic or otherwise hazardous nature of the gases may be only temporarily deactivated by adsorption. To permanently destroy the gas, the activated carbon or other adsorbent needs to be destroyed. Many facilities incinerate containerized gases by venting them directly into an incinerator. Based on the above discussion, the Agency believes that incineration (thermal reduction or oxidation) is demonstrated (Rissmann 1989).

1.3.3 Ignitable Reactives Subcategory

The waste characterization in Section 1.1.3 describes these wastes as nonwastewaters that can ignite when they come in contact with water and release gases; therefore, the Agency considered applicable technologies for this subcategory to be those technologies that remove the characteristic of ignitability. EPA has identified deactivation technologies such as controlled detonation and controlled treatment with water to be applicable technologies.

Open detonation involves a violent chemical reaction within a chemical compound or mechanical mixture producing heat and pressure. The reaction proceeds through the reacted material toward the untreated material at a supersonic velocity.

As mentioned earlier, radioactive zirconium fines have been included in the D001 Ignitable Reactives Subcategory. The Deparment of Energy submitted data that appear to indicate that this waste can be stabilized to remove the reactivity characteristic. Stabilization is not usually considered to be a method of deactivation, and EPA is concerned that this treatment may be a form of impermissible dilution rather than a chemical reaction (i.e., oxidation) that removes the reactivity characteristic (Hunt 1989).

Some of these D001 wastes, such as calcium carbide slag, are often placed in specially designed units (some may be technically classified as waste piles by the Agency) for the purposes of controlled deactivation with water. Other wastes, such as those containing reactive alkali metals (sodium), are often open detonated or reacted with water under controlled conditions, which typically generates dilute alkaline solutions that can then be neutralized. EPA has identified one facility using hydrolysis as treatment of alkali metals (Yoder 1989). The Agency believes that most, if not all, D001 Ignitable Reactives are being treated in a manner that renders the waste nonignitable and no longer D001 hazardous; therefore, these deactivation technologies are demonstrated to treat wastes in this subcategory.

1.3.4 Oxidizers Subcategory

For D001 wastes in the Oxidizers Subcategory, deactivation appears to be the primary applicable treatment option. Deactivation with an appropriate chemical reagent renders the waste nonignitable. The Agency has information indicating that the Department of Defense generates D001 Oxidizer Wastes from treatment by open burning or open detonation of waste propellants. These wastes should be treated with an appropriate chemical reducing agent under controlled conditions. Although it is possible that certain aqueous solutions of these oxidizers may be useful in the treatment of other hazardous wastes (e.g., permanganates and peroxides can be used to oxidize toxic organics or cyanide wastes), the Agency believes that these wastes should be deactivated or used as treatment reagents in tanks and not in surface impoundments because of the potential release of heat and volatile organics during the oxidation/reduction reactions. The Agency has information from 1986 TSDR Survey (USEPA 1989b) indicating that D001 Oxidizer Wastes can be treated with chemicals to render them nonignitable; therefore, these technologies are demonstrated.

1.4 Identification of Best Demonstrated Available Technology (BDAT)

This section presents the rationale for the determination of best demonstrated available technology or technologies for D001 wastes. The Agency believes that there are two major options for evaluating potential treatment standards for each D001 characteristic waste subcategory. The first and most preferred option is for EPA to propose numerical treatment standards; however, numerical standards are difficult to establish for D001 wastes because of the extensive universe of constituents in every waste stream. The second and next preferred option is to propose a method or sequence of methods of treatment as BDAT.

The following sections describe the BDAT for each treatability group. If a waste is a D001 waste because it fits under more than one D001 treatability group, the waste must be treated by the BDAT technologies that are listed for each applicable subcategory (unless the initial treatment produces a non-D001 waste residue). It is possible that the use of the treatment technologies will, for many of these wastes, result in a residual that no longer exhibits any of the characteristics. In this case, the waste is no longer subject to the requirements of Subtitle C of RCRA. However, the use of the treatment technologies designated as BDAT does not imply that the residues from treatment are nonhazardous. In some cases, treatment to remove one characteristic may result in a residue that has a different characteristic and thus requires further treatment. For example, treatment of a D001 waste using incineration may remove the ignitable characteristic but result in an ash that will have an EPA toxic characteristic for metals and will need metals treatment. Proposed treatment standards for all D001 wastes are summarized in Table 1-1 located at the end of this section.

It is important to note that management practices have been established for ignitable wastes in surface impoundments, waste piles, land treatment units, and landfills (see 40 CFR 264.229, 264.256, 264.281, and 264.312, as well as 265.229, 265.256, 265.281, and 265.312). When finalized, the treatment standards proposed today for ignitable (D001) wastes will supersede the above-mentioned provisions and exclusions for permissible land disposal of these waste outlined in Parts 264 and 265; therefore, the Agency is proposing to revoke these Part 264 and 265 sections. Facilities handling ignitable wastes will have to comply with the promulgated treatment standards for these wastes in order to land dispose them.

The Agency is revoking these sections to avoid potential conflicts between the proposed treatment standards and existing Part 264 and 265 and 265 land disposal provisions for D001 wastes. The Agency believes that protection of human health and the environment will be better accomplished by the proposed standard, since compliance with the treatment standards will render these waste nonhazardous by permanently eliminating the characteristic (i.e., ignitability).

1.4.1 Ignitable Liquids Subcategory

The Agency first studied the option of transferring the standards for these constituents from the corresponding F001-F005 standards promulgated in the November 7, 1986, final rule (51 FR 40642), since some D001 Ignitable Liquids have been shown to contain organic constituents that are also constituents in F001-F005 solvents. However, the Agency believes that this option would create an unnecessary burden on the regulated community in several ways. The majority of D001 wastes in the Ignitable Liquids Subcategory probably do not contain these constituents, but generators of D001 wastes would be required to perform a significant amount of testing and certification. Also, the F001-F005 standards are based on analysis of an extract obtained from use of the Toxicity Characteristic Leaching Procedure (TCLP), not on analysis of the total concentration in a representative sample of the waste. Therefore, the Agency prefers to deal with these issues in a future rulemaking. EPA may establish standards based on analysis of total constituent concentrations to replace the current F001-F005 standards and then the new standards could be transferred to the appropriate wastes in the Ignitable Liquids Subcategory. Because the technical and legal issues of such transfers have not been resolved, however, the Agency is not proposing concentration-based D001 treatment standards based on F001-F005 treatment performance data at this time. Nevertheless, it may reevaluate its position in the future and reverse this determination.

EPA considered a second option by examining all demonstrated technologies to determine whether one method performs better than another. Thermal destruction technologies such as incineration and reuse as a fuel will completely remove the characteristic of low flash point by destroying the organics, thereby rendering the waste nonignitable. The Agency does not want to preclude the use of distillation or other recovery techniques for these wastes. At the same time, the Agency does not believe that most of these wastes are necessarily recoverable by processes such as distillation. Furthermore, distillation still bottoms may be ignitable and require further treatment. While recovery options may be preferable to incineration or fuel substitution for some of the D001 wastes in this treatability group, the end result must be the same (i.e., the residues must not be ignitable). The choice among incineration, fuel substitution, or recovery can then be made by the generator or treater, based on economics and on the ability of the particular recovery system to handle the waste. Based on the fact that all these techniques can remove the characteristic of ignitability permanently, EPA is proposing a treatment standard of "Incineration, Fuel Substitution, or Recovery as Methods of Treatment" for D001 in the Ignitable Liquids Subcategory. This standard will establish incineration, fuel substitution, or recovery as mandatory processes for handling D001 Ignitable Liquids.

1.4.2 Ignitable Compressed Gases Subcategory

Since a numerical standard is not practical for this category because of the variety of gases that are listed as D001, the Agency considered both demonstrated technologies for proposing treatment method standards for compressed ignitable gases. The preferred (and most likely application) is that of recovery by direct reuse. Typically, the contents of the cylinders and the cylinders themselves are directly reused (i.e., refilled). The second technology that the Agency considered was incineration by venting the gas onto an incinerator or by venting the gas into an appropriate adsorbent material (provided that air emissions can be controlled), followed by incineration of the adsorbed gas/adsorbent material combination. There may be cases when this will be preferred over the direct venting of the gas into the incinerator (e.g., to reduce the risk of explosion). In order to comply with the treatment standard in this case, however, the adsorbed gas must be incinerated to destroy or remove the characteristic permanently.

The Agency is proposing a treatment standard of "Recovery or Incineration of Vented Ignitable Gases as Methods of Treatment" for these wastes. This treatment standard will apply to all forms of the ignitable compressed gases.

1.4.3 Ignitable Reactives Subcategory

The Agency believes that the development of a method of treatment is better than establishment of a numeric standard for ignitable reactive wastes. Any numerical treatment standards based on the demonstrated deactivation technologies (i.e., chemical deactivation, open detonation) would be difficult because there is no known analytical test designed to measure uniformly and equitably the ignitability of these reactive materials. Additionally, there are no EPA-approved tests that distinguish the reactive chemical from the deactivated chemical (e.g., sodium).

Information does suggest that all these wastes can be treated by some form of deactivation (e.g., open detonation and controlled chemical deactivation) to remove the characteristic of ignitability for the D001 Ignitable Reactives. However, the Agency has determined that within the D001 Ignitable Reactives Subcategory there appears to be a further variety of different waste groups, each with a certain degree of uniqueness with respect to hazard and handling requirements. Therefore, the Agency believes that the actual method of "Deactivation" chosen for each waste may be specific to that waste and may be best determined by the generator or the treater most knowledgeable as to the waste's unique hazards and handling requirements. Furthermore, the Agency currently has no information that suggests that one particular technology may be generally applicable to all wastes within the D001 Ignitable Reactives Subcategory, nor that there is one particular technology that can be identified as "best." Hence, EPA is proposing "Deactivation as a Method of Treatment" standard for these wastes. The Agency believes this is an appropriate approach for these wastes since the hazardous characteristic is based on imminent hazard (i.e., ignitability) rather than on other criteria such as levels of hazardous constituents. Furthermore, by establishing this as a treatment standard, the Agency believes that the variance procedures could be used to provide a more complete evaluation of the safety hazards associated with each deactivation or open detonation procedure at individual facilities.

1.4.4 Oxidizers Subcategory

The Agency considered monitoring the treatment of wastes in this group by the use of a sensor called an oxidation reduction potential (ORP) cell. The ORP sensor electronically measures, in millivolts, the level to which the oxidation reduction reaction has proceeded at any given time. However, the ORP reading is pH dependent and varies by the type of oxidizer. Additionally, the Agency has determined that within the D001 Oxidizers Subcategory there appears to be a further variety of different waste groups, each with a certain degree of uniqueness with respect to hazard and handling requirements. As a result, EPA does not believe that all wastes in this category are amenable to oxidation reduction treatment (e.g., nonwastewaters) and that the actual method of "Deactivation" chosen for each waste may be specific to that waste. Deactivation technologies may be best determined by the generator or the treater most knowledgeable as to the waste's unique hazards and handling requirements. Furthermore, the Agency currently has no information that suggests that one particular technology may be generally applicable to all wastes within the D001 Oxidizer Subcategory, nor that there is one particular technology that can be identified as "best."

Consequently, the Agency is proposing a treatment standard of "Deactivation as a Method of Treatment" for D001 wastes in the Oxidizer Subcategory based on the fact that deactivation will remove the characteristics of ignitability. As stated previously for wastes in the Ignitable Reactives Subcategory, the Agency believes that the variance procedures could be used as a method of providing a more complete evaluation of the safety hazards associated with each individual deactivation or open detonation procedure at each facility.

TABLE 1-1 BDAT TREATMENT STANDARDS FOR D001

IGNITABLE LIQUIDS SUBCATEGORY BASED ON 261.21(a)(1)
INCINERATION, FUEL SUBSTITUTION,* OR RECOVERY AS METHODS OF TREATMENT

IGNITABLE COMPRESSED GASES SUBCATEGORY BASED ON 261.21(a)(3)
RECOVERY OR INCINERATION* OF VENTED** IGNITABLE GASES AS METHODS OF TREATMENT

IGNITABLE REACTIVES SUBCATEGORY BASED ON 261.21(a)(2)
DEACTIVATION AS A METHOD OF TREATMENT

OXIDIZERS SUBCATEGORY BASED ON 261.21(a)(4)
DEACTIVATION AS A METHOD OF TREATMENT

* Incinerators must comply with 40 CFR, 264 Subpart 0 or 265 Subpart 0. Fuel substitution units must be in compliance with 40 CFR Part 266 Subpart D.

** Ignitable gases may be vented directly into an incinerator or into a suitable adsorbent prior to incineration. Although the gases, once vented, are no longer compressed in a cylinder, the Agency does not consider that treatment has occurred until the ignitable gas has been incinerated. Adsorption of the ignitable gas into either a solid or liquid adsorbent is typically a reversible physical process. Thus, the ignitable chemical has not been destroyed.

2. CHARACTERISTIC CORROSIVE WASTES (D002)

According to 40 CFR 261.22(a), there are two criteria for defining a waste as a D002 Corrosive Waste. Paraphrasing these criteria, a waste can be a D002 waste if (1) it is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5 or (2) it is a liquid and corrodes steel at a specified rate at a specified temperature.

EPA determined that these criteria translated into three treatability groups for D002 wastes. The first two treatability groups are classified as the Acid subcategory and the Alkaline subcategory and refer to those D002 wastes that exhibit the properties listed in §261.22(a)(1). The Acid subcategory is defined as those wastes with a pH of less than or equal to 2, and the Alkaline subcategory is defined as those wastes with a pH of greater than or equal to 12.5. Also by definition, D002 wastes in the Acid subcategory and Alkaline subcategory include only wastes that are considered to be "aqueous." This is because standard pH measurement can only be performed in the presence of water (i.e., pH is an indication of the concentration of hydrogen ions in water). The third subcategory is classified as the Other Corrosives subcategory and is defined as those D002 wastes that exhibit the corrosivity to steel as listed in §261.22(a)(2). These are often nonaqueous corrosive wastes such as certain organic liquids. They may also be aqueous liquids with a pH between 2 and 12.5.

2.1 Waste Characterization

The Agency realizes that the compositions of D002 can vary significantly, and hence it is impossible to characterize every D002 waste stream that can be generated. Consequently, the Agency based its BDAT development on generalizations from the definition in 40 CFR and limited characterization data. The data available for D002 single waste streams are shown in Table B-1 in Appendix B.

Most of corrosive wastes are acidic (82 percent) and inorganic (82 percent) and are characterized as dilute (94.3 percent of liquids). Typically, corrosive wastes that are disposed of by deep well injection are likely to contain toxic organics, whereas landfilled wastes are likely (38 percent) to contain heavy metals (Wilk 1988).

2.1.1 Acid/Alkaline Subcategories

D002 wastes in the Acid subcategory commonly include concentrated spent acids, acidic wastewaters, and spent acid strippers and cleaners. Similarly, those wastes in the Alkaline subcategory typically include concentrated spent bases, alkaline wastewaters, and spent alkaline strippers and cleaners. Most D002 wastes generated are in the Acid subcategory. Wastes from both subcategorys are generated by almost every industry and represent a significant proportion of all hazardous wastes.

2.1.2 Other Corrosives Subcategory

Wastes in the Other Corrosives subcategory are generated on a sporadic basis and generally in low volumes. The Agency suspects that these wastes are often identified as corrosives without performing the specified testing with steel (i.e., the corrosivity of the waste may be assumed because of the presence of known corrosive constituents). This may also be due, in part, to the high cost of testing and to the difficulties in finding laboratories that are experienced in steel corrosion testing.

The physical and chemical characteristics of this group of wastes vary greatly. These wastes may be aqueous or organic. In addition, a large variety of corrosive chemicals may be constituents in this type of corrosive waste. The ability of the waste to corrode the tested steel (i.e., SAE 1020 steel) depends on the concentration of corrosive chemicals. Chemicals that may contribute to this corrosivity include ferric chloride, benzene sulfonyl chloride, benzotrichloride, acetyl chloride, formic acid, hydrofluoric acid, some catalysts, various resins, metal cleaners, and etchants. Highly concentrated acids that have no water content may also be included in this subcategory since pH measurements are not possible on these types of wastes.

2.2 Industries Affected

Because of the diverse nature and magnitude (over 2,500 generators) of the industries generating D002 wastes, EPA will not attempt to describe every industry that generates characteristic corrosive wastes. Table B-1 located in Appendix B presents information from a number of RCRA permitted facilities that generated D002 wastes in 1986. The approximate volumes produced and a description of the industries generating the wastes are included on the table. This information has been gathered from the 1986 Generator Survey, and confidential business information is not included. Table B-2 provides industrial generation information on a percentage basis (Wilk 1988).

2.2.1 Acid/Alkaline Subcategories

Wastes from both of these subcategories are generated by nearly every industry and represent a significant proportion of all hazardous wastes. The primary industrial applications for acids and bases that result in generation of corrosive wastes are (1) use as chemical intermediates in the inorganic and organic chemical manufacturing industries; (2) use as metal cleaning agents in metal production and fabrication industries; and (3) use in boiler blowdown and stack gas treatment, primarily in electricity generating facilities. Other significant corrosive waste sources include refining processes in the petroleum industry and pulping liquor in the paper industry.

2.2.2 Other Corrosives Subcategory

Most of these wastes are generated by the chemicals industry and are byproducts or cleaning wastes. Concentrated phenolics generated by the petroleum industry are included in this subcategory. "Other organic liquids" classified as D002 are generated by the noncellulosic organic fibers industry, plastic materials and resins industry, and the paper coating and glazing industry.

2.3 Applicable/Demonstrated Technologies

This section describes the applicable and demonstrated treatment technologies pertinent to the treatment of D002 wastes. To be applicable, a technology must theoretically be usable to treat the waste in question or a similar waste. To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or a similar waste.

2.3.1 Acid/Alkaline Subcategories

These subcategorys have been defined as hazardous because of their extremes in pH. The technology identified by EPA as applicable for treatment of these wastes is neutralization. Any neutralization technology (i.e., the addition of acid or alkali to change the pH to an appropriate value) will completely remove the characteristic of pH below 2 or above 12.5, thereby rendering the waste noncorrosive with respect to pH. Some facilities generate waste streams that fluctuate from the Acid Subcategory to the Alkaline Subcategory depending upon what processes are being used on a given day. The Agency believes that these facilities can take advantage of the fluctuations in pH by mixing the acid streams with the alkaline streams, hence performing onsite neutralization. The Agency has information indicating that most D002 wastes in both the Acid and Alkaline Subcategories are already being treated by neutralization; thus, neutralization is demonstrated to treat such wastes (USEPA 1989c).

The choice of neutralizing reagents is dependent upon the subcategory of the waste, i.e., the acid wastes will require bases for neutralization and alkaline wastes will require acids. Alkaline reagents commonly used to neutralize strongly acidic waste streams include high calcium lime and caustic soda. For the treatment of dilute acidic waste streams, limestone treatment may also be feasible. Mineral acids such as sulfuric or hydrochloric acid are the primary reagents used for the neutralization of corrosive alkaline waste streams (Wilk 1988).

Pretreatment requirements prior to neutralization typically consist of gross solids removal (i.e., filtration), flow equalization, or treatment of individual waste streams before combining with other process wastes. Treatment of segregated wastes for purposes other than pH adjustment results in economic benefits from reduced reagent costs and smaller equipment sizing. Common pretreatment processes include cyanide destruction, chromium reduction, metals precipitation from highly chelated wastes, and oil removal.

Neutralization with chemicals is not the same as simple dilution to achieve a neutral pH. While dilution causes a change in pH (i.e., change in the concentration of the hydronium ion), that change is merely the addition of significant quantities of water in order to arrive at a neutral pH, with the ions associated with the acid (or base) remaining in solution. Neutralization with chemicals (i.e., acids or bases) involves a chemical reaction that uses a chemical change to achieve neutral pH, with the ions either remaining in solution or precipitating as a sludge.

When selecting neutralization reagents, it is important to consider the solubility of the salts produced as a result of neutralization. This is illustrated by the following scenario. Chemical neutralization of 1 gallon of concentrated sulfuric acid with caustic (sodium hydroxide) results in 21 pounds of soluble salts (in the form of sodium sulfate) that, if improperly managed, could adversely impact fresh water ecosystems. However, chemical neutralization with lime (calcium hydroxide) results in 20 pounds of relatively insoluble, nontoxic sludge that would have to be land disposed or otherwise recovered. (This solid waste could potentially be recycled or reused depending upon other constituents such as metals that may co-precipitate along with the solids.) In fact, data from the Toxic Release Inventory (TRI) indicate that sodium sulfate is the chemical being discharged in largest volumes to surface water. Therefore, the Agency prefers to neutralize D002 wastes so that relatively nontoxic solid wastes are generated rather than wastewater discharges with high dissolved solid contents, which could adversely impact fresh water ecosystems. This is further illustrated by the discharge of soluble nitrate (either from neutralization or from dilution of nitric acid, the second most frequently used acid in industry) and soluble phosphate (from phosphoric acid). Both of these ions are considered nutrients to aquatic ecosystems, and at low levels contribute to the overall growth of fresh water ecosystems. However, the discharge of excessive amounts (or slugs of concentrations) of these ions could expedite algal growth and adversely impact the balance of the ecosystems.

In addition to neutralization technologies, the Agency has information indicating that several facilities are recovering wastes belonging to the D002 Acid subcategory and Alkaline subcategory. Hence, the Agency believes that recovery technologies are also demonstrated to treat D002 acid and alkaline wastes.

2.3.2 Other Corrosives Subcategory

For D002 wastes in the Other Corrosives subcategory, deactivation (i.e., chemical treatment) appears to be an applicable treatment option. In some cases, deactivation of the corrosive constituents of the waste with an appropriate chemical reagent will render the constituent noncorrosive. An example of this treatment would be the reaction of benzene sulfonyl chloride with dilute sodium hydroxide solution under carefully controlled conditions that will yield a solution containing sodium benzene-sulfonate and sodium chloride that no longer has any of the characteristics of a hazardous waste.

Incineration of D002 wastes that contain high concentrations of corrosive organics is also a common practice. The Agency has identified at least one facility incinerating wastes in this subcategory; hence, incineration is demonstrated. Because of the wide variety of corrosive organics, however, the Agency does not believe that incineration is applicable treatment for each waste in this subcategory.

Removal and recovery of either organic or inorganic corrosive constituents may also be an applicable technology that could render these wastes noncorrosive. Recovery could involve extraction of the corrosive constituents, until the waste itself is no longer considered corrosive (to SAE 1020 steel). Organics present in the wastewater may be recovered by technologies such as distillation, steam stripping, solvent extraction or thin film evaporation. The Agency has identified at least one facility using recovery technologies for treatment of D002 wastes in this subcategory and, therefore, recovery is demonstrated to treat D002 acid or alkaline wastes (USEPA 1989d).

2.4 Identification of Best Demonstrated Available Technology (BDAT)

The Agency believes that there are two major options for evaluating potential treatment standards for D002 characteristic wastes: (1) propose numerical treatment standards, and (2) establish a method of treatment. Proposed treatment standards for D002 are summarized in Table 2-1 at the end of this section.

It is important to point out that the residues from all neutralization processes may possibly be considered hazardous wastes by other hazardous waste definitions. In particular, the neutralization sludge residues may exhibit the characteristic of EP toxicity for metals.

2.4.1 Acid/Alkaline Subcategory

EPA is proposing a treatment standard of "Base Neutralization to pH 6 to 9 and Insoluble Salts" for the D002 Acidic Subcategory. Likewise, EPA is proposing a treatment standard of "Acid Neutralization to pH 6 to 9 and Insoluble Salts" for the D002 Alkaline Subcategory.

The Agency is proposing a range of pH 6 to 9 instead of the characteristic range of pH 2 to 12.5 for several reasons. First, hydronium ions from acids solubilize cations from clay liners, impacting their ability to act as barriers to migration. Moreover, acid wastes between pH 2 and 6 can increase the mobility of many hazardous constituents in ground water relative to wastes in the pH range of 6 to 9.

The Agency prefers neutralization of corrosive wastes over simple dilution because dilution merely creates a larger volume of wastes, but does not treat or remove hazardous constituents in the wastes. Moreover, neutralization conserves natural resources and protects aquatic ecosystems. An example of how neutralization conserves natural resources (i.e., water) is shown in the following scenario. Dilution of 1 gallon of the most frequently used industrial acid, concentrated sulfuric acid, to a pH of just above 2 requires 3,600 gallons of water. Dilution to completely neutralize the concentrated sulfuric acid to a pH of 7 would require approximately 360,000,000 gallons of water. On the other hand, 1 gallon of this acid can be neutralized to pH 7 with only 12 pounds of caustic (sodium hydroxide) or only 11 pounds of lime (calcium hydroxide). Treatment to achieve pH 2 actually requires slightly less caustic or lime; however, the amount is not substantially less than the amount required to neutralize to pH 7.

The Agency recognizes, however, that dilution to facilitate treatment may be necessary (i.e., the added water serves as a heat sink that is necessary to control very exothermic reactions or toxic air emissions). Dilution to facilitate treatment is not prohibited.

EPA is also proposing "Recovery as a Method" as a treatment standard. Recovery options have been demonstrated for a variety of corrosive wastes. While recovery options may be preferred over neutralization, the end result of no land disposal of a corrosive waste is the same. The choice between neutralization and recovery may be made by the generator or a centralized treatment operation, according to the applicability and performance of a given type of acid/base recovery system. Once the material becomes a recovered product, it is no longer a RCRA-regulated material, even if it remains corrosive.

By establishing these treatment standards, the Agency believes that a variance from this standard could be considered for D002 wastes that cannot be effectively neutralized (40 CFR 268.44). Such a situation could occur for small quantities of corrosive materials containing extremely toxic or otherwise hazardous chemicals that may cause an unnecessary risk during neutralization.

The Agency is aware that regulations were promulgated for liquid wastes having a pH of less than or equal to 2.0 in the California List final rule (52 FR 25760) by codifying the statutory level of pH greater than 2.0 into 40 CFR 268.32. This rulemaking, however, is not adequate to address the universe of D002 wastes. The California List restrictions apply only to liquid "corrosive wastes," without specifically identifying them as D002 wastes. Furthermore, the California List final rule did not specify neutralization as a required treatment standard; in fact, the waste may be merely rendered nonliquid prior to land disposal and still satisfy the California List requirements. Therefore, the Agency is today proposing treatment standards for D002 wastes that will supersede the California List regulations because today's standards are more specific.

2.4.2 Other Corrosives Subcategory

EPA is proposing a treatment standard of "Deactivation: SAE 1020 Steel Corrosion Rate <6.35 mm/yr" for D002 wastes in the Other Corrosives Subcategory. The Agency believes that this is an appropriate approach for these wastes since the hazardous characteristic is based on imminent hazard (i.e., the corrosivity to steel may cause rupture of a tank or container, thus releasing the contents either suddenly or through leaks), rather than on other criteria such as levels of hazardous constituents. The standard will allow treatment with technologies such as chemical deactivation, incineration, or recovery to remove the hazardous corrosive characteristic from the waste. Additionally, by establishing this standard, the Agency believes that a variance from it could then be considered for D002 wastes that could not be effectively deactivated.

TABLE 2-1 BDAT TREATMENT STANDARDS FOR D002
ACID SUBCATEGORY
261.22(a)(1)

NEUTRALIZATION WITH BASES TO: 6< pH <9 AS INSOLUBLE SALTS OR RECOVERY AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR D002
ALKALINE SUBCATEGORY
261.22(a)(1)

NEUTRALIZATION WITH ACIDS TO: 6< pH <9 AS INSOLUBLE SALTS OR RECOVERY AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR D002
OTHER CORROSIVES
261.22(a)2

DEACTIVATION TO: SAE 1020 STEEL CORROSION RATE <6.35 mm/yr AS A METHOD OF TREATMENT

3. CHARACTERISTIC REACTIVE WASTES (D003)

According to 40 CFR 261.23(a), there are eight criteria for defining a waste as a D003 Reactive Waste. Paraphrasing these criteria, a waste can be a D003 waste if (1) it is unstable and readily undergoes violent changes without detonating; (2) it reacts violently with water; (3) it forms potentially explosive mixtures with water; (4) when mixed with water, it generates toxic gases; (5) it is a cyanide- or sulfide-bearing waste that, under certain conditions, can generate toxic gases; (6) it is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement; (7) it is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure; or (8) it is a forbidden explosive, a Class A explosive, or a Class B explosive.

EPA determined that these eight criteria translated directly into five treatability groups for D003 wastes. The first treatability group is classified as Reactive Cyanides Subcategory and refers to those D003 wastes that exhibit the properties listed in §261.23(a)(5) for cyanide. The second treatability group is classified as the Explosives Subcategory and refers to those D003 wastes that exhibit the properties listed in §§261.23(a)(6) through 261.23(a)(8). The third treatability group is classified as the Water Reactives Subcategory and refers to those D003 wastes that exhibit the properties listed in §§261.23(a)(2) through 262.23(a)(4). The fourth treatability group is classified as the Reactive Sulfides Subcategory and refers to those D003 wastes that exhibit the properties listed in §261.23(a)(5) for sulfide. The fifth treatability group is classified as the Other Reactives Subcategory and refers to those D003 wastes that exhibit the properties listed in §261.23(a)(1).

3.1 Waste Characterization

The Agency realizes that the compositions of D003 can vary significantly; hence, the Agency will not attempt to characterize every D003 waste stream that can be generated. Consequently, the Agency bases its BDAT development on a generalization of characteristics for each of the five subcategories listed previously. Tables C-1 and C-2 in Appendix C present some characterization for the RCRA-permitted facilities that generate D003 and D003 wastes mixed with other RCRA-listed and characteristic wastes, respectively.

3.1.1 Reactive Cyanides Subcategory

D003 wastes in the Reactive Cyanides Subcategory are, by definition, those cyanide-bearing wastes that generate toxic gases (assumed to be hydrogen cyanide) when exposed to pH conditions between 2 and 12.5 in a sufficient quantity to present a danger to human health and the environment. The majority (by volume) of all D003 wastes that are generated can be identified as belonging to the Reactive Cyanides Subcategory. These are typically solid cyanide compounds from plating operations and rinse waters from electroplating or heat treating. The data in Table C-3 in Appendix C show that the nonwastewaters can contain concentrations up to 70 percent cyanide and the wastewaters can contain up to 720 ppm cyanide.

3.1.2 Explosives Subcategory

D003 wastes in the Explosives Subcategory are, by definition, those wastes that are (1) capable of detonation or explosive reaction if subjected to a strong initiating source; (2) if heated under confinement, readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure; or (3) a forbidden explosive as defined in 49 CRF 173.51, a Class A explosive as defined in 49 CFR

173.53, or a Class B explosive as defined in 49 CFR 173.88. These definitions, as presented in 49 CFR, can be found in Appendix D of this document.

While these wastes are not generated as frequently as the reactive cyanides, they are generated more often than all other reactive subcategories. The available characterization data for this subcategory are shown on Tables C-4 and C-5 in Appendix C. These data show wastes containing nitrocellulose, ethyl centralite, isomers of TNT, nitroglycerin, and other explosive compounds. Most of these wastes in the Explosive Subcategory appear to be solids.

3.1.3 Water Reactives Subcategory

D003 wastes in the Water Reactives Subcategory can be either organic or inorganic in nature. All of these wastes (1) react violently with water; (2) form potentially explosive mixtures with water; or (3) when mixed with water, generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment. These wastes are generated on a sporadic basis and generally in low volumes.

Wastes believed to be in the Water Reactive Subcategory are shown in Table C-6 in Appendix C. Wastes in the Water Reactives Subcategory include waste batteries (probably lithium), slags generated by the gray iron foundries industry, and scrap alkali metals. Additionally, wastes containing benzalchloride are water reactive. Benzotrichloride exists as an unstable liquid that fumes in air and hydrolyzes in the presence of moisture, forming benzoic and hydrochloric acids.

3.1.4 Reactive Sulfides Subcategory

D003 wastes in the Reactive Sulfides Subcategory are, by definition, those sulfide-bearing wastes that generate toxic gases (assumed to be H_2S) when exposed to pH conditions between 2 and 12.5 in a sufficient quantity to present a danger to human health and the environment. The Agency believes that some of these wastes may also be contaminated with organic sulfides such as mercaptans. The data in Table C-7 in Appendix C show that petroleum wastes can contain up to 60 percent sulfides. These wastes are by BDAT definition nonwastewaters. The wastewaters can contain up to 4.3 percent sulfides.

3.1.5 Other Reactives Subcategory

D003 wastes in the Other Reactives Subcategory are wastes that are normally unstable and readily undergo violent change without detonating. These wastes may be either organic or inorganic. Information suggests that these wastes are infrequently generated and probably in small quantities. The data in Table C-8 in Appendix C show characterization data for wastes believed to be in the D003 Other Reactives Subcategory. Most of these wastes are reactive or polymerizable organics generated during halogenation and may contain fluorine.

3.2 Industries Affected

Because of the diversity of industries generating D003 wastes, the Agency will not describe every industry that generates characteristic reactive wastes. Tables C-1 and C-2 located in Appendix C present industry descriptions of the RCRA-permitted facilities that generated D003 wastes and D003 mixed wastes, respectively. The approximate volumes produced and the current waste management practices are also included on both tables. This information has been gathered from the 1986 TSDR Survey (USEPA 1986), and confidential business information is not included. The following are brief summaries describing by subcategory the industries that will be affected by the land disposal ban of D003 wastes.

3.2.1 Reactive Cyanides Subcategory

As stated in the waste characterization section, the majority of the quantity of all D003 wastes that are generated can be identified as belonging to the Reactive Cyanides Subcategory. These D003 wastes typically have been identified as being generated by the electroplating and metal finishing industries and include mixed cyanide salts, cyanide solutions, and cyanide-bearing sludges.

3.2.2 Explosives Subcategory

These wastes typically have been identified as being generated by the explosives industry during the production of ammunition by the space industry during the production of rocket fuels and by the U.S. Department of Defense. The medical industry also generates an explosive waste possibly containing nitroglycerin, since this compound is used in heart medicine.

3.2.3 Water Reactives Subcategory

The generators of wastes in this subcategory are primarily those industries using or producing alkali metals, for example, the chemicals industry and a few segments of the nonferrous metals industry. Other generators include facilities discarding lithium batteries. The organic chemicals industry also generates wastes containing benzalchloride.

3.2.4 Reactive Sulfides Subcategory

Industries generating wastes containing reactive sulfides include the industrial organic chemicals industry during "cleanout of equipment," the petroleum industry during "cleanout of production processes," and the inorganic chemicals industry during "filtration/centrifuging" processes.

3.2.5 Other Reactives Subcategory

The Agency has limited information concerning wastes in this subcategory. It is believed that most wastes in the Other Reactives Subcategory are generated mainly by the organic chemicals industry during halogenation processes.

3.3 Applicable/Demonstrated Technologies

This section describes the applicable and demonstrated treatment technologies pertinent to the treatment of D003 wastes and current management practices for these wastes. To be applicable, a technology must theoretically be usable to treat the waste in question or a similar waste. To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or of a similar waste.

Most generators of D003 wastes are currently performing some form of treatment. The reason for this is because reactive wastes are already restricted from placement in surface impoundments, waste piles, land treatment units, and landfills according to 40 CFR 264.229, 264.256, 264.281, and 264.312, respectively. The following paragraph is paraphrased from the CFR for disposal requirements for reactive wastes:

> Reactive waste must not be placed in a surface impoundment, waste pile, land treatment unit, or landfill, unless the following conditions are met. (1) The waste is treated, rendered, or mixed before or immediately after placement in the impoundment so that the resulting waste, mixture, or dissolution of material no longer meets the definition of reactive waste. (2) The owner or operator of a facility that treats, stores, or disposes of reactive waste takes precautions to prevent reactions that generate extreme heat or

pressure, fire or explosions, or violent reactions; produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment; produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions; damage the structural integrity of the device or facility; or threaten human health or the environment through other like means. (3) The waste is managed in such a way that it is protected from any material or conditions that may cause it to ignite or react.

3.3.1 Reactive Cyanides Subcategory

Reactive cyanide wastes are already restricted from disposal in landfills under existing regulations of wastes containing reactive listing constituents. Under the California List restrictions, the statute already prohibits liquid wastes having free cyanide concentrations in excess of 1,000 mg/kg (ppm) from being land disposed, as codified in §268.31. However, these restrictions refer to these wastes only as "cyanide wastes" without specifically identifying them as D003 wastes or any of the other wastes listed for their cyanide content. The statutory restriction did not specify any treatment technology, nor did it establish the 1,000 mg/kg as a "treatment standard." While these liquid reactive cyanide wastes are not typically placed in most types of land disposal units, it is possible that some have been or are being placed in surface impoundments. Technologies considered to be applicable/demonstrated to treat wastes in the Reactive Cyanides subcategory are those technologies that destroy the cyanide in the waste.

EPA has identified six technologies as potentially applicable for treatment of cyanides in both wastewaters and nonwastewaters: (1) electrolytic oxidation; (2) chemical oxidation with several oxidizing agents, such as hypochlorite or chlorine (alkaline chlorination), permanganate, ozone, or SO_2/air (Inco process); (3) wet air oxidation; (4) high temperature cyanide hydrolysis; and (5) incineration. The first four technologies are most effective in treatment of cyanide in wastes that contain primarily dissolved or soluble cyanide salts, but are also applicable to treatment of wastewater treatment sludges and other solids that contain treatable concentrations of cyanide. Incineration is applicable to nonwastewater forms of the wastes.

Electrolytic oxidation followed by alkaline chlorination, chemical oxidation (alkaline chlorination or other methods) alone, electrolytic oxidation alone, wet air oxidation, and high temperature hydrolysis reduce the concentration of cyanide in the wastewaters or nonwastewaters treated. These technologies fully destroy the amenable cyanide present in the waste, but treat the complexed cyanides to varying degrees, depending on, among other things, the stability of the metal-cyanide complex and the severity of the oxidizing agent and reaction conditions. Iron cyanide complexes are typically the most resistant to oxidation treatment.

EPA has identified incineration as an applicable technology for treatment of cyanide in wastes containing high concentrations of organics. Incineration is a thermal treatment process that destroys the organic and oxidizable inorganic waste constituents. Incineration of this waste generates an ash and a scrubber water that may require further treatment for metallic constituents if present.

Available information shows that electrolytic oxidation followed by alkaline chlorination, alkaline chlorination alone, wet air oxidation, high temperature hydrolysis, SO_2/air oxidation, and incineration, is demonstrated for treatment of concentrated cyanide-containing wastes. The Agency believes that most D003 Reactive Cyanides are already being treated by alkaline chlorination or electrolytic oxidation. They typically contain high concentrations of the cyanide compounds. Many oxidation/reduction technologies, such as alkaline chlorination or electrolytic oxidation, are believed to be able to lower the concentration of cyanide so that the waste will not contain reactive levels of cyanides, thereby removing the hazardous characteristic.

3.3.2 Explosives Subcategory

The Agency has identified open detonation, open burning, and incineration as applicable methods of treatment. All of these processes would be expected to remove the explosive characteristic of D003 waste permanently.

Open detonation involves a violent chemical reaction within a chemical compound or mechanical mixture evolving heat and pressure. The reaction proceeds through the reacted material toward the unreacted material at a supersonic velocity.

Open burning is the burning of materials in the open air, either on the ground surface or in a containment device, without significant control of the combustion and in such a manner that the products of combustion are emitted directly into the ambient air without passing through a device intended to control gaseous or particulate emissions.

Improper management of the ash/residue and contaminated soil generated at the open burning unit may result in environmental contamination through the air, soil, and subsurface and surface water pathways. For example, the ash must be sampled to determine whether it is a hazardous waste through the use of the reactivity and EP toxicity analyses. The Department of Defense (DOD) community typically uses the Bureau of Mines gap test and the detonation deflagration transition test to determine whether a sample is reactive (Department of the Army 1987);

however, there is no approved EPA method. Additionally, some reactive hazardous wastes may generate residues that may contain nitrates and perchlorates in concentrations sufficiently high to qualify as oxidizers as defined in 49 CFR 173.151. In that case, these residues would be ignitable hazardous wastes (D001). This oxidizer determination would only be necessary where wastes that could possibly generate oxidizers are thermally treated.

Incineration is also an applicable technology. Incineration is a technology that destroys the organic constituents in the waste by converting them to carbon dioxide, water, and other combustion products. Incineration may result in residuals that may require treatment because of their metal content. Specifically, the residuals consist of ash and scrubber water. Incineration of highly explosive constituents may require treatment in units that are specially designed and fitted with certain explosion-proof equipment. These types of units are not typically found at commercial incineration facilities. The Agency is aware that these types of units are currently used for many of the DOD explosive wastes and that there appears to be a trend to decrease the reliance on open detonation for these wastes.

While these explosive wastes are not typically placed in most types of land disposal units, it was common practice to thermally destruct (i.e., open detonate, open burn) these wastes. In fact, the Agency believes that most D003 wastes that are generated in the Explosives Subcategory are currently treated by open burning, open detonation, or incineration in specially designed units; hence, these technologies are all demonstrated.

3.3.3 **Water Reactive Subcategory**

Because of their violent reactivity with water, these wastes are not typically placed in land disposal units and certainly are not generally placed in surface impoundments. Applicable treatment technologies for these wastes would be to react the wastes with water under controlled conditions or controlled detonation; however, these reactions are often vigorous and extremely difficult to control. The most common treatment for these wastes is actually controlled reaction with water and neutralization of the acid or alkali solution generated. A less common method is controlled detonation. During detonation, it is theorized that the reactive organic constituents are destroyed by the explosion and that the reactive inorganic constituents form less hazardous oxides or react with other chemicals in the explosion (such as moisture from the air).

The Agency has information indicating that several facilities are treating water reactive wastes with deactivation technologies like hydrolysis. Consequently, the Agency believes hydrolysis to be demonstrated to treat water reactive wastes.

3.3.4 Reactive Sulfides Subcategory

Applicable treatment for sulfide wastes would be to chemically convert the reactive sulfides to sulfur, to insoluble metallic sulfide salts, or to insoluble sulfates that can be removed or recovered. Some data indicate that these wastes can be treated by alkaline chlorination, incineration, or chemical deactivation techniques. The Agency has information indicating that at least one facility is using alkaline chlorination and at least one facility is using incineration to treat D003 Reactive Sulfides, hence, both technologies are demonstrated. In some instances, the D003 may be in a form amenable to recovery of sulfur by sulfuric acid production from incineration of stack gases. The Agency knows of one facility currently burning D003 Reactive Sulfide Wastes in an incinerator with a scrubber to produce sulfuric acid.

The Agency believes that some of these wastes may also be contaminated with organic sulfides known as mercaptans. These malodorous chemicals are believed to complicate the treatment of these reactive sulfide wastes. The Agency has information indicating that mercaptans can be oxidized to sulfates and the corresponding acid using chlorine dioxide (McGlatheny 1989). Consequently, EPA belives chemical oxidation to be demonstrated to treat D003 sulfide reactive wastes.

3.3.5 Other Reactives Subcategory

The Agency suspects that while these wastes may be generated, it is unlikely that they would require placement in any type of land disposal unit. In general, the Agency believes that these unstable wastes can be deactivated using either incineration in special units or open detonation. The Agency has information indicating that one facility is using "heat treatment of a reactive fluorocarbon contaminated wastewater" to deactivate a waste believed to belong in this subcategory. As a result, the Agency believes that deactivation technologies are demonstrated to treat wastes in the Other Reactives Subcategory.

3.4 Identification of Best Demonstrated Available Technology (BDAT)

The Agency believes that there are two major options for evaluating potential standards for each D003 characteristic waste subcategory. The first option is for EPA to propose numerical treatment standards. However, for all subcategories of D003 wastes except the reactive cyanides, the Agency believes that development of any numerical treatment standards, based on any of the appropriate deactivation techniques, would be difficult because there is no known analytical test designed to measure the reactivity for these wastes, nor is there a test that distinguishes the reactive chemical from the deactivated chemical (e.g., sodium). The second option is to propose a method or sequence of methods of treatment as BDAT. Table 3-1 located at the end of this chapter presents the proposed treatment standards for all subcategories of D003.

All of the known treatment processes for the five subcategories of D003 Reactive Wastes can result in significant amounts of solid residues. These residues may or may not exhibit the characteristic of EP toxicity for metals. Instead of trying to establish metal standards for these residues, the Agency prefers to regulate land disposal of them only if they appear to be EP toxic wastes. Thus, the Agency is currently not considering proposing standards for metals in the residues from the deactivation of D003 wastes.

It is important to note that management practices have already been established for reactive wastes in surface impoundments, waste piles, land treatment units, and landfills (see 40 CFR 264.229, 265.256, 264.281, and 264.312, as well as 265.229, 265.256, 265.281, and 265.312). When finalized, the treatment standards proposed today for reactive (D003) wastes will supersede the above-mentioned provisions and exclusions for permissible land disposal of these wastes outlined in Parts 264 and 265. Therefore, the Agency is proposing to revoke these sections. Facilities handling reactive wastes will have to comply with the promulgated treatment standards for these wastes in order to land dispose them.

The Agency is revoking the 40 CFR 264 and 265 sections to avoid potential conflicts between these proposed treatment standards and existing land disposal provisions for D003 wastes. The Agency believes that protection of human health and the environment will be better accomplished, since compliance with the treatment standards will render these wastes nonhazardous by permanently eliminating the characteristic (reactivity).

3.4.1 Reactive Cyanides Subcategory

EPA is proposing treatment standards for wastes in the D003 Reactive Cyanides Subcategory as the direct transfer of concentration-based treatment standards for total and amenable cyanides from treatment standards developed for the Second Third final rule for wastewaters and nonwastewaters for cyanide wastes (e.g., F011, F012, and P030). For the purpose of determining the applicability of the treatment standards, the Agency defined wastewaters as wastes containing less than 1 percent (weight basis) total suspended solids and less than 1 percent (weight basis) total organic carbon (TOC). Waste not meeting this definition must comply with the treatment standards for nonwastewaters. Since the Agency has data indicating that the wastes can exit in both wastewater and nonwastewater forms and the Agency has performance data for each form, EPA is proposing to establish numerical standards for D003 wastewater and nonwastewater.

The Agency believes that D003 wastes more closely resemble P030 rather than F006-F009 wastes because D003 wastes are listed as "reactive" cyanides and P030 represents "soluble" cyanides, which are likely to liberate hydrogen cyanide when acidified. The Agency believes that D003 wastes that cannot meet the proposed treatment standards may potentially be mislabeled and perhaps are not "reactive" cyanides. It is possible that some generators are misclassifying their F wastes (i.e., F006 through F012) as D003. By establishing the lower standard for D003 wastes, the Agency may actually encourage proper identification of the F cyanide wastes. Higher cyanide standards have been promulgated for these F cyanides because they are known to contain interferences and a significant concentration of complexed cyanides rather than "reactive" or "soluble" cyanides. For more information on the development of this standard, see the background document for cyanide wastes (USEPA 1988b).

3.4.2 **Explosives Subcategory**

The Agency believes that most D003 wastes that are generated in the Explosives Subcategory are currently treated by thermal destruction (i.e., open detonation or incineration in specially designed units). By simple deduction, this process would be expected to remove the explosive characteristic of the D003 waste.

Because of the large number of explosive formulations and the difference in applicable treatments (Department of the Army 1984), the Agency is proposing a standard of "Deactivation as a Method of Treatment" for wastes in this group. By establishing this standard, the Agency is allowing the regulated community to use that treatment technology (i.e., incineration, chemical deactivation, etc.) which best fits the type of explosive waste requiring treatment. Furthermore, by establishing this as a treatment standard, the Agency believes that the variance procedures could be used as a method of providing a more complete evaluation of the safety hazards associated with each individual deactivation or open detonation procedure at each facility. This may be the preferred approach, in that (1) it appears to provide more assurance of the protection of human health and the environment at each individual site by providing a more extensive technical evaluation by regulatory personnel; (2) it allows the wastes to be treated by any treatment technology that may be developed (such as specially designed incineration units); and (3) it also bans most forms of land disposal.

3.4.3 Water Reactives Subcategory

The Agency is proposing a standard of "Deactivation as a Method of Treatment" for the D003 wastes containing reactive listing constituents in the Water Reactives Subcategory. The Agency believes this is an appropriate approach for these wastes since the hazardous characteristic is based on imminent hazard (i.e., potential violent reaction with water) rather than on other criteria such as levels of hazardous constituents and that technologies exist that can completely remove these characteristics.

By establishing deactivation as a treatment standard, the Agency believes that the variance procedures could be used as a method of providing a more complete evaluation of the safety hazards associated with each individual deactivation or open detonation procedure at each facility. This may be the preferred approach in that (1) it appears to provide more assurance of the protection of human health and the environment at each site by providing a more extensive technical evaluation by regulatory personnel; (2) it allows the wastes to be treated by any treatment technology that may be developed (such as controlled hydrolysis); and (3) it also bans most forms of land disposal.

3.4.4 Reactive Sulfides Subcategory

The Agency is in the process of developing a quantitative threshold for toxic gas generation for reactive sulfide wastes. The interim value the Agency is considering is 500 milligrams of hydrogen sulfide generated per kilogram of waste (Claussen). Since, the Agency has not yet approved a standard analytical method for testing either sulfides or reactive sulfides in hazardous wastes or in nonwastewater treatment residues, the Agency is unable to propose a numerical treatment standard for D003 wastes in this subcategory at this time. However, it may develop a method and establish numerical standards for wastes in this group in the future. Consequently,
EPA is proposing a treatment standard of "Alkaline Chlorination, Chemical Oxidation, or Incineration Followed by Precipitation to Insoluble Sulfates."

3.4.5 Other Reactives Subcategory

The Agency is proposing a standard of "Deactivation as a Method of Treatment" for wastes in this subcategory because of their uniqueness with respect to hazard and handling requirements. By simple deduction, this process would be expected to remove the reactive characteristic of the D003 waste.

By establishing this standard, the Agency is allowing the regulated community to use that treatment technology (i.e., incineration, chemical deactivation, etc.) which best fits the type of reactive waste requiring treatment. The Agency believes this is an appropriate approach for these wastes since the hazardous characteristic is based on imminent hazard (e.g., violent reactions). Further, by establishing this as a treatment standard, the Agency believes that the variance procedures could be used as a method of providing a more complete evaluation of the safety hazards associated with each deactivation procedure at each facility.

TABLE 3-1 BDAT TREATMENT STANDARDS FOR D003

REACTIVE CYANIDES SUBCATEGORY
BASED ON 261.23(a)(5)
[Nonwastewaters]

Regulated Constituent	Maximum for any Single Grab Sample Total Composition (mg/kg)
Cyanides (Total)	110
Cyanides (Amenable)	9.1

REACTIVE CYANIDES SUBCATEGORY
BASED ON 261.23(a)(5)
[Wastewaters]

Regulated Constituent	Maximum for any Single Grab Sample Total Composition (mg/l)
Cyanides (Total)	1.9
Cyanides (Amenable)	0.10

REACTIVE SULFIDES SUBCATEGORY
BASED ON 261.23(a)(5)

ALKALINE CHLORINATION, CHEMICAL OXIDATION OR INCINERATION* FOLLOWED BY PRECIPITATION TO INSOLUBLE SULFATES AS METHODS OF TREATMENT

EXPLOSIVES, WATER REACTIVES, AND OTHER REACTIVES SUBCATEGORIES
BASED ON 261.23(a)(6), 261.23(a)(2) THROUGH (4), AND 261.23(a)(1), RESPECTIVELY

DEACTIVATION AS A METHOD OF TREATMENT

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* - Incinerators must comply with 40 CFR 264 Subpart O or 265 Subpart O.

4. P AND U WASTES CONTAINING REACTIVE LISTING CONSTITUENTS

This chapter describes regulations for the RCRA-listed P and U wastes containing reactive listing constituents. These wastes pose a significant risk during handling because of their reactivity. Development of BDAT for P and U wastes containing reactive listing constituents has been added to this document since some of these wastes may be similar to some D003 wastes based on the characteristic of reactivity. The hazardous wastes with hazardous waste codes beginning with P are identified as acute hazardous waste, while the hazardous waste codes beginning with U identify toxic wastes. Whether a waste is an acute hazardous waste or a toxic waste generally has no bearing on the treatability of the waste. The following is the list of P and U wastes containing reactive listing constituents:

P006 - Aluminum phosphide
P009 - Ammonium picrate
P015 - Beryllium dust
P056 - Fluorine
P068 - Methyl hydrazine
P073 - Nickel carbonyl
P081 - Nitroglycerine
P087 - Osmium tetroxide
P096 - Phosphine
P105 - Sodium azide
P112 - Tetranitromethane
P122 - Zinc phosphide (>10%)

U023 - Benzotrichloride
U086 - 1,2-Diethylhydrazine
U096 - a,a-Dimethylbenzylhydroperoxide
U098 - 1,1-Dimethylhydrazine
U099 - 1,2-Dimethylhydrazine
U103 - Dimethyl sulfate
U109 - Diphenylhydrazine
U134 - Hydrogen fluoride
U133 - Hydrazine
U135 - Hydrogen sulfide
U160 - Methyl ethyl ketone peroxide
U189 - Phosphoric sulfide
U249 - Zinc phosphide (<10%)

It should be mentioned that strontium sulfide (P107) was a reactive listing constituent. However, the Agency is not regulating P107 because on October 31, 1988, it was removed from Appendix VIII of Part 261, the list of RCRA hazardous constituents. EPA took this action because strontium sulfide, even when improperly treated, stored, transported, disposed of, or otherwise managed, does not pose a significant hazard to human health or the environment.

However, wastes containing strontium sulfide are not released from regulatory control under RCRA. If a waste contains high concentrations of strontium sulfide, it may exhibit the characteristic of reactivity (40 CFR 261.23(a)(5)) (i.e., a sulfide-bearing waste that, when exposed to pH conditions between 2 and 12.5, can generate toxic gases (e.g., H_2S), vapors, or fumes in a quantity sufficient to present a danger to human health or the environment). If the wastes exhibit the characteristic of reactivity, they must be handled as characteristic hazardous wastes in the D003 Reactive Sulfide Subcategory as described in this document.

4.1 Waste Characterization

According to 40 CFR 261.33, the P and U codes presented above are essentially commercial chemical products (or intermediates) and become hazardous wastes when they are discarded or are intended to be discarded; when they are mixed with waste oil, used oil, or another material; when they are applied to the land for dust suppression or road treatment; when they are otherwise applied to the land in lieu of their original intended use or when they are contained in products that are applied to the land in lieu of their original intended use; or when, in lieu of their original intended use, they are produced for use as (or as a component of) a fuel, distributed for use as a fuel, or burned as a fuel.

These materials can be present in different forms:

- Any commercial or off-specification commercial chemical product (or intermediate) with any of the above generic names;
- Residues remaining in containers that held any of the above-mentioned products (or intermediates); or
- The residue of contaminated soil, water, or other debris that results when there is a cleanup of a commercial product (or intermediate) or off-specification commercial chemical product (or intermediate) or manufacturing chemical intermediate having the generic name of any of the above-listed products that had been spilled onto the land or into the water.

Since the Agency could not characterize every P and U waste stream that could possibly be generated, the Agency has based its BDAT development on the characteristics of the pure chemical that was listed. Below are descriptions of the pure chemical elements or compounds. The waste codes are listed next to the chemical names; however, these descriptions may not always be indicative of the different P and U wastes containing the reactive chemicals that could be generated. The chemical structures of each listing constituent are shown in Table E-1 located in Appendix E. Where noted, the wastes have been listed for their reactivity. All the wastes react violently in some way, but are not all listed for reactivity. A brief statement about why each waste has been listed is also presented below.

P006 - Aluminum phosphide: This compound exists as dark gray or dark yellow crystals with a cubic zinc blend structure. It must be protected from moist air since it reacts readily to produce phosphine, which is highly toxic. It does not melt or decompose thermally at temperatures up to 1000°C. When water and acid are added to aluminum phosphide, phosphine is produced in quantitative yields. The waste is listed for reactivity and toxicity.

P009 - Ammonium picrate: This compound exists as bright yellow, bitter scales, or orthorhombic crystals. It explodes easily from heat or shock and is soluble in water at 20°C. The waste is listed for reactivity.

P015 - Beryllium dust: This compound exists as a gray metal with a close-packed hexagonal structure. Beryllium has a melting point of 1287°C and a boiling point of 2500°C. The dust or amalgamated metal reacts with hydrochloric acid, dilute sulfuric acid, and dilute nitric acid, and reacts violently with strong bases. In both cases, it causes an evolution of hydrogen. Death may result from short exposure to very low concentrations of the dust or its salts.

P056 - Fluorine: This halogen exists as F_2 in its elemental state and is a pale yellow gas. Fluorine has a melting point of -219.61°C and a boiling point of -188.13°C. Fluorine is the most reactive nonmetal, and it reacts vigorously with most oxidizable substances at room temperature, frequently with ignition. Its violent reactions with organic compounds usually disintegrate the metal. This gas is dangerous to inhale.

P068 - Methyl hydrazine: This compound exists as a clear liquid with an odor that is characteristic of short chain, organic amines. It has a flash point of 70°C and an ignition temperature of 196°C. The vapors may explode and self-ignite in and on contact with oxidizing agents. The chemical is soluble in hydrocarbons. Methyl hydrazine is considered a mild alkaline base and a strong reducing agent. It ignites spontaneously on contact with strong oxidizing agents such as fluorine, chlorine trifluoride, nitrogen tetroxide, and fuming nitric acid.

P073 - Nickel carbonyl: This chemical is a colorless, volatile liquid at standard temperature and pressure. It is extremely poisonous. It oxidizes in the air and explodes at about 60°C. Nickel carbonyl is made by passing carbon monoxide over finely divided nickel.

P081 - Nitroglycerin: This chemical exists as a pale yellow, oily liquid that explodes on rapid heating or on concussion. It crystallizes in two forms and begins to decompose at 50° to 60°C. Nitroglycerinis appreciably volatile at 100°C, evolves nitrous yellow vapors at 135°C, and explodes at 281°C. On explosion, harmless gases (i.e., oxygen, nitrogen, carbon dioxide) are produced. The waste is listed for reactivity and toxicity.

P087 - Osmium tetroxide: The form of this compound is a pale yellow solid. It exists as monoclinic crystals. Osmium tetroxide has a boiling point of 130°C and begins to sublime and distill well below the boiling point. It is soluble in benzene. The vapor is extremely poisonous. This compound is a strong oxidant.

P096 - Phosphine: This chemical compound is a poisonous gas at standard temperature and pressure. It is prepared from white phosphorus and aqueous alkali hydroxide and also by treatment of PH_4I with KOH. This gas is spontaneously flammable in air if there is a trace of P_2H_4 present and burns with a luminous flame. Phosphine is slightly soluble in water and combines violently with oxygen and the halogens. It liberates hydrogen and forms the phosphide when passed over heated metal and forms phosphonium salts when brought in contact with the halogen acids.

P105 - Sodium azide: This compound exists as crystals that decompose into sodium and nitrogen when heated. It is soluble in water at 10°C and in alcohol at 25°C. Sodium azide can react with lead and its compounds to form explosive chemicals.

P112 - Tetranitromethane: This compound exists as a pale yellow liquid. It is insoluble in water and freely soluble in alcohol. It attacks iron, copper, brass, zinc, and rubber. Tetranitromethane can be decomposed by an alcoholic solution of potassium hydroxide. It is used as a powerful oxidizing agent. It has a boiling point of 126°C and is highly explosive in the presence of impurities. The waste is listed for reactivity.

P122 - Zinc phosphide: The chemical exists as dark gray tetragonal crystals and powder. The chemical has a faint phosphorous odor. When heated with the exclusion of air, it melts and finally sublimes. The melting point has been given as 420°C and the boiling point as 1100°C. When kept dry, it is quite stable. It is insoluble in water and alcohol, but soluble in benzene and carbon disulfide, causing the evolution of spontaneously flammable phosphine. It reacts violently with concentrated sulfuric acid and other oxidizing agents. The waste is listed for reactivity and toxicity.

U023 - Benzotrichloride: Benzotrichloride exists as an unstable liquid that fumes in air and hydrolyzes in the presence of moisture, forming benzoic and hydrochloric acids. It is insoluble in water but soluble in alcohol, benzene, ether, and many other organic solvents. The boiling point is 220.8°C. The waste is listed for reactivity, corrosivity, and toxicity.

U086 - 1,2-Diethylhydrazine: This compound is soluble in alcohol and ether. It has a boiling point of 86°C. When heated to decomposition, it emits toxic fumes of NO_x.

U096 - a,a-Dimethylbenzylhydroperoxide: a,a-Dimethylbenzyhydroperoxide's boiling point is 100 to 101°F. This compound is an oxidizer and is listed as toxic.

U098 - 1,1-Dimethylhydrazine: This compound is a flammable, hygroscopic, mobile liquid that fumes in air and gradually turns yellow. It is corrosive to skin and has a characteristic ammoniacal odor of aliphatic hydrazines. The chemical is miscible with water, causing the evolution of heat. It is also miscible with alcohol, ether, dimethylformamide, and hydrocarbons. The boiling point is 63.9°C.

U099 - 1,2-Dimethylhydrazine: This chemical fumes in air and gradually turns yellow. It is miscible with water with the evolution of heat. This compound is corrosive to the skin.

U103 - Dimethyl sulfate: This chemical is a colorless, oily liquid with a boiling point of about 188°C with decomposition and a flash point of 182°C. It is extremely hazardous with no warning characteristics (e.g., odor, irritation).

U109 - Diphenylhydrazine: The form of this compound is yellow crystals with a melting point of 34.5°C. It is insoluble in water and freely soluble in alcohol and ether.

U133 - Hydrazine: Hydrazine exists as a colorless, oily liquid that fumes in air. It has a penetrating odor resembling that of ammonia. Hydrazine is a violent poison that causes delayed eye irritation. It burns with violet flame and explodes during distillation if traces of air are present (also affected by ultraviolet light and metal ion catalysts). The flash point is 126°F (52°C). Hydrazine can be stored for years if sealed in glass and kept in a cool, dark place. It forms salts with inorganic acids. The chemical is a highly polar solvent and powerful reducing agent. It dissolves many inorganic substances and is miscible with water, methyl, ethyl, propyl, and isobutyl alcohols. Hydrazine forms an azeotropic mixture with water. The waste is listed for reactivity and toxicity.

U134 - Hydrogen fluoride: Hydrogen fluoride is a colorless gas that fumes in air. It is listed as highly irritating, corrosive, and poisonous. In aqueous solutions, it is a weak acid. The boiling point is -56°C.

U135 - Hydrogen sulfide: This chemical is a flammable, poisonous gas with a characteristic odor of rotten eggs that is perceptible in air in a concentration of 0.002 mg/l. It burns in air with a pale blue flame. The ignition temperature is 260°C. Hydrogen sulfide has explosive limits when mixed with air. Water solutions of hydrogen sulfide are not stable, absorbed oxygen causes the formation of elemental sulfur, and the solutions become turbid rapidly. It is soluble in glycerol. In a fifty-fifty by volume mixture of glycerol and water, the precipitation of sulfur is retarded considerably.

U160 - Methyl ethyl ketone peroxide: The waste is listed for reactivity and toxicity. The chemical will explode when heated and is a strong oxidizer.

U189 - Phosphoric sulfide: This compound exists as light yellow, triclinic crystals with a peculiar odor. It has a melting point of 286° to 290°C and a boiling point of 513° to 515°C. This chemical decomposes in water, forming phosphoric acid and hydrogen sulfide. It is soluble in carbon disulfide and in aqueous solutions of alkali hydroxides. It must be kept tightly closed. The waste is listed for reactivity.

U249 - Zinc phosphide: The chemical exists as dark gray tetragonal crystals and powder. The chemical has a faint phosphorous odor. When heated with the exclusion of air, it melts and finally sublimes. The melting point has been given as 420°C and the boiling point as 1100°C. When kept dry, it is quite stable. It is insoluble in water and alcohol but soluble in benzene and carbon disulfide, causing the evolution of spontaneously flammable phosphine. It reacts violently with concentrated sulfuric acid and other oxidizing agents. The waste is listed for reactivity and toxicity.

It should be mentioned that a waste is not necessarily a P waste or a U waste if it contains one or more of the chemicals with a generic name listed in 40 CFR 261.33. In other words, the fact that a waste contains, say, aluminum phosphide does not automatically render the waste P006 hazardous waste. P and U wastes are limited to commercial products or intermediates or off-specification versions thereof that are spilled, discarded, or intended to be discarded. Thus, a waste containing aluminum phosphide would be a P006 hazardous waste only if some or all of aluminum phosphide in the waste were a commercial product, intermediate, or off-specification version thereof at some point in its existence prior to its incorporation into the waste. The available characterization data for the P and U wastes containing reactive listing constituents is presented in Appendix E in Table E-2.

4.2 Industries Affected

The Agency does not intend to describe every industry that generates the P and U wastes containing reactive listing constituents, since any industrial facility that produces, uses, stores, and/or transports the chemicals has the potential of generating the waste. Table E-3 located in Appendix E presents a description of the RCRA-permitted facilities that generated the above-listed wastes and the approximate volumes produced in 1986 (confidential business information is not included). The following is a summary of the producers of the chemicals and the generators of the waste. Brief descriptions of the uses of the chemicals are also presented to indicate areas of potential waste generation.

P006 - Aluminum phosphide: There are no listed producers of this chemical in SRI 1988 edition. One generator in EPA Region IV is listed in the 1986 TSDR Survey.
USE: Source of phosphine; in semiconductor research; as a fumigant.

P009 - Ammonium picrate: One producer located in EPA Region II is listed in SRI; however, the facility is selling all stock that was originally imported and does not manufacture ammonium picrate. There were no generators of P009 wastes listed in the 1986 TSDR Survey.
USE: Explosives, fireworks, rocket propellants.

P015 - Beryllium dust: Two mines currently process beryllium ore. Thirteen generators are listed in the TSDR Survey as generating P015 in 1986; 1 in EPA Region II, 2 in EPA Region III, 2 in EPA Region IV, 1 in EPA Region V, 1 in EPA Region VI, 1 in EPA Region VIII, 4 in EPA Region IX, and 1 in EPA Region X.
USE: Source of neutrons when bombarded with alpha particles. As a neutron reflector and neutron moderator in nuclear reactors. In radio tube parts and aerospace structures. In inertial guidance systems.

P056 - Fluorine: One producer was listed in the SRI 1988 edition. One generator in Region II is listed in the 1986 TSDR Survey.
USE: Powerful fluorinating agent.

P068 - Methyl hydrazine: No producers are listed in SRI 1988 edition. Three generators are listed in the 1986 TSDR Survey: one located in EPA Region III, one located in EPA Region V, and one in EPA Region VI.
USE: In rocket fuel; intermediate in chemical synthesis.

P073 - Nickel carbonyl: One company located in EPA Region III is listed as a producer in SRI 1988 edition. One generator in EPA Region III is listed in the 1986 TSDR Survey.
USE: Laboratory and organic synthesis.

P081 - Nitroglycerin: Five U.S. military installations are currently producing this chemical. Two are located in EPA Region II, two are located in EPA Region III, and one is located in EPA Region VII. There are no P081 waste generators listed in the 1986 TSDR Survey.
USE: Explosives (dynamite is 75 percent nitroglycerin) and veterinary pharmaceuticals.

P087 - Osmium tetroxide: Three producers are listed in SRI 1988 edition: one located in EPA Region I, one located in EPA Region II, and one located in EPA Region III. There are eight generators of P087 listed in the 1986 TSDR Survey: two located in Region II, one in Region IV, three in Region V, one in Region VI, and one in Region VIII.
USE: Oxidizing agent particularly for converting olefins to glycols. Catalyzes chlorate, peroxide, periodate, and other oxidations. As a fixing and staining agent for cell and tissue studies.

P096 - Phosphine: Nine producers are listed in the 1988 edition of SRI: one in Region I, one in Region II, one in Region IV, one in Region V, one in Region VI, and three in Region IX. Two facilities are listed as generators in the 1986 TSDR Survey: one in EPA Region V and one in EPA Region VI.
USE: Gaseous dopent for semiconductors.

P105 - Sodium azide: There are no producers listed in the 1988 edition of SRI. Seventeen generators are listed in the 1986 TSDR Survey: one in EPA Region I, six in EPA Region II, three in EPA Region III, one in EPA Region IV, two in EPA Region V, three in EPA Region VI, and one in EPA Region X.
USE: In the preparation of hydrazoic acid, lead azide, pure sodium; as a propellant for inflating automotive safety bags; in weed and fruit rot control.

P112 - Tetranitromethane: One chemical producer in EPA Region II is listed in the SRI 1988 edition, and no generators of P112 are listed in the 1986 TSDR Survey.
USE: Oxidizer in rocket propellants. As explosive in admixture with toluene, to increase cetane number of diesel fuels. Reagent for detecting the presence of double bonds in organic compounds. Has been proposed as an irritant war gas.

P122 - Zinc phosphide: One chemical producer, located in EPA Region V, is listed in the SRI 1988 edition. There is one generator, located in EPA Region V, of P122 waste listed in the 1986 TSDR Survey.
USE: In rat and field mice poison preparations.

U023 - Benzotrichloride: In the 1988 edition of SRI, one company in Region II is listed as producing benzotrichloride, and the same company is listed as generating U023 in the 1986 TSDR Survey.
USE: Intermediate for pesticides.

U086 - 1,2-Diethylhydrazine: There are no listed producers in the SRI 1988 edition. One generator of U086 in Region V is listed in the 1986 TSDR Survey.
USE: Polymer additives, fuels, photographic chemicals, and dyes.

U096 - a,a-Dimethylbenzylhydroperoxide: There are four listed producers in the SRI 1988 edition: two in Region II, one in Region III, and one in Region V. No generators are listed in the 1986 TSDR Survey.
USE: Intermediate in acetol/phenol production process.

U098 - 1,1-Dimethylhydrazine: One listed producer in Region VI of the chemical is in the SRI 1988 edition. Three generators are listed in the 1986 TSDR Survey: one in Region II and two in Region V.
USE: Base for rocket fuel formulations.

U099 - 1,2-Dimethylhydrazine: No producers are listed in the SRI 1988 edition, and no generators are listed in the 1986 TSDR Survey.
USE: The base in rocket fuel formulations.

U103 - Dimethylsulfate: Two producers are listed in the SRI 1988 edition and five generators are listed in the 1986 TSDR Survey. The two producers are located in EPA Regions II and III, and the five generators are located in Regions I, II, III, IV, and V.
USE: Methylating agent in the manufacture of many organic chemicals.

U109 - Diphenylhydrazine - No producers are listed in the SRI 1988 edition. Two generators are listed in the 1986 TSDR Survey, both located in EPA Region V.
USE: In the manufacture of hydrochloride, which is used as reagent for ababrnose and lactose.

U133 - Hydrazine - One producer, located in EPA Region V, is listed in the SRI 1988 edition, and 17 generators are listed in the 1986 TSDR Survey. Two of the generators are located in EPA Region I, one in Region II, one in Region III, three in Region IV, three in Region V, two in Region VI, two in Region VIII, one in Region IX, and two in Region X.
USE: Reducing agent; organic hydrazine derivative; rocket fuel.

U134 - Hydrogen fluoride: Four producers are listed in the SRI 1988 edition. According to the 1986 TSDR Survey, there is one facility in Region I, two facilities in Region III, seven facilities in Region V, one facility in Region VI, one facility in Region VIII, three facilities in Region IX, and one facility in Region X generating this waste.

USE: Catalyst in petroleum industry, use in fluorination processes, especially in the aluminum industry, in the manufacture of fluorides, in making fluorine-containing plastics, and for separating uranium isotopes.

U135 - Hydrogen sulfide: Twelve facilities are listed in the SRI 1988 edition as producing hydrogen sulfide, and five facilities are listed in the 1986 TSDR Survey as generating U135 wastes. The facilities producing hydrogen sulfide are located as follows: one in EPA Region I, one in EPA Region II, one in EPA Region III, one in EPA Region IV, two in EPA Region V, three in EPA Region VI, one in EPA Region VIII, and two in EPA Region IX. The facilities that generated hydrogen sulfide waste (U135) in 1986 are located as follows: one in Region I, Region III, Region IV, Region V, and Region IX.
USE: In the manufacture of chemicals, in metallurgy; as an analytical reagent.

U160 - Methyl ethyl ketone peroxide: No producers are listed in the SRI 1988 edition. Eight facilities are listed as generating U160 in the 1986 TSDR Survey: two in Region II, two in Region IV, one in Region V, one in Region VI, one in Region IX, and one in Region X.
USE: A widely used polymer-curing agent.

U189 - Phosphoric sulfide: Six facilities are listed as producers of phosphoric sulfide, and four facilities are listed as generators of U189 wastes. One facility producing phosphoric sulfide is located in EPA Region III, while three are in Region IV, one is in Region V, and one is in Region VII. The four facilities that generated U189 in 1986 are located in EPA Regions V, VI, VII, and X.
USE: In manufacture of lube oil additives and pesticides; manufacture of safety matches and ignition compounds; for introducing sulfur into organic compounds.

U249 - Zinc phosphide: One chemical producer, located in EPA Region V, is listed in the SRI 1988 edition. One generator of U249 waste, in EPA Region IX, is listed in the 1986 TSDR Survey.
USE: In rat and field mice poison preparations.

4.3 Analytical Issues

For all but two P and U constituents (i.e., P015, beryllium dust, and U109, diphenylhydrazine), methods to analyze the listed constituents in treatment residues are not currently available. Although the Agency recognizes that these compounds exist, and that the manufacturers may have methods to verify their purity and determine their product specifications, there are no EPA-approved analytical procedures to ascertain trace quantities of these chemicals either in the raw sample or in the residues from treatment. In addition, EPA has not identified any constituents in these wastes that could be used as a surrogate or as an indicator compound. These wastes include the following:

P006 - Aluminum phosphide
P009 - Ammonium picrate
P056 - Fluorine
P068 - Methyl hydrazine
P073 - Nickel carbonyl
P081 - Nitroglycerine
P087 - Osmium tetroxide
P096 - Phosphine
P105 - Sodium azide
P112 - Tetranitromethane
P122 - Zinc phosphide (>10%)

U023 - Benzotrichloride
U086 - 1,2-Diethylhydrazine
U096 - a,a-Dimethylbenzylhydroperoxide
U098 - 1,1-Dimethylhydrazine
U099 - 1,2-Dimethylhydrazine
U103 - Dimethyl sulfate
U133 - Hydrazine
U134 - Hydrogen fluoride
U135 - Hydrogen sulfide
U160 - Methyl ethyl ketone peroxide
U189 - Phosphoric sulfide
U249 - Zinc phosphide (<10%)

In the future, methods may be developed and approved for use in analyzing some of the P and U reactive constituents. Table E-4 in Appendix E presents the analytical problems associated with some of the reactive listing constituents for the P and U waste codes.

4.4 Applicable/Demonstrated Technologies

This section identifies the applicable and demonstrated treatment technologies for the P and U wastes containing reactive listing constituents. To be applicable, a technology must theoretically be usable to treat the waste in question or a similar waste. To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or of a similar waste.

4.4.1 Applicable Treatment Technologies

Because the Agency has no waste characterization specifically for the reactive P and U wastes, the applicable technologies are based on the characteristics present in Section 4.1 for the reactive listing constituents for the P and U wastes.

The following subsections present applicable treatment technologies for the (1) organic constituents, (2) metal constituents, and (3) inorganic constituents other than metals in nonwastewater and wastewater forms of the P and U wastes containing reactive constituents. For the purpose of the land disposal restrictions rule, wastewaters are defined as wastes containing less than 1 percent (weight basis) total suspended solids and less than 1 percent (weight basis) total organic carbon (TOC). Wastes not meeting this definition are classified as nonwastewaters. For a more detailed discussion of each treatment technology, see USEPA 1989a.

(1) Applicable treatment technologies for organic constituents. For wastes containing reactive organic constituents, the technologies considered applicable are those that destroy the organics in a manner that is safe to human health and the environment.

Nonwastewaters. The technologies that the Agency has identified as applicable for treatment of nonwastewaters containing reactive organic constituents are open detonation, open burning, and incineration.

Open detonation involves a violent chemical reaction within a chemical compound or mechanical mixture evolving heat and pressure. The reaction proceeds through the reacted material toward the unreacted material at a supersonic velocity.

Open burning is the burning of materials in the open air, either on the ground surface or in a containment device, without significant control of the combustion, and in such a manner that the products of combustion are emitted directly into the ambient air without passing through a device intended to control gaseous or particulate emissions. Improper management of the ash/residue and contaminated soil generated at the open burning unit could result in environmental contamination through the air, soil, and subsurface and surface water pathways. First of all, the ash must be sampled to determine whether it is a hazardous waste through the use of the reactivity and EP toxicity analyses. The DOD community typically uses the Bureau of Mines gap test and the detonation deflagration transition test to determine whether a sample is reactive; however, there is no approved EPA method. Additionally, some reactive hazardous wastes may generate residues that may contain nitrates and perchlorates in concentrations sufficiently high to qualify as oxidizers as defined in 49 CFR 173.151. In that case, these residues would be ignitable hazardous wastes (D001). This oxidizer determination would only be necessary where wastes that could possibly generate oxidizers are thermally treated.

Incineration of the P and U nonwastewaters containing reactive constituents is also an applicable technology. Incineration is a technology that destroys the organic constituents in the waste by converting them to carbon dioxide, water, and other combustion products. Incineration may result in residuals that require treatment because of their metal content. Specifically, the residuals consist of ash and scrubber water. Incineration of highly explosive constituents may require treatment in units that are specially designed and fitted with certain explosion-proof equipment. These types of units are not typically found at commercial incineration facilities. The Agency is aware that these types of units are currently used for many of the Department of Defense explosive wastes and that there appears to be a trend to decrease the reliance on open detonation for these wastes.

Wastewaters. The Agency has identified carbon adsorption followed by regeneration or incineration of the spent carbon, wet air oxidation, biological treatment, and solvent extraction as potentially applicable for treatment of hazardous P and U reactive organic constituents in wastewaters. Additionally, incineration has been identified for wastewaters containing high levels of reactive compounds that may become increasingly dangerous when concentrated on carbon or in an extraction fluid.

These applicable technologies destroy or reduce the total concentration of hazardous organic compounds in the waste (incineration, wet air oxidation, and biological treatment) or selectively remove hazardous organic compounds from the waste stream (carbon adsorption and solvent extraction). The Agency believes that not all P and U wastes contain reactive listing constituents amenable to treatment with biological, wet air oxidation, and solvent extraction methods. However, most of these wastewaters are somewhat amenable to carbon adsorption because the constituents typically have low solubility in water, have high molecular weights, and have branched, rather than straight chain, molecular structures. Compounds with lower molecular weights and higher solubilities have also been successfully treated using carbon adsorption. Illustrations supporting this argument are presented in Appendix F.

(2) Applicable treatment technology for metal constituents. The technologies considered applicable to treat P and U wastes containing reactive metal constituents are those that remove the reactive characteristic and/or recover the metals.

Nonwastewaters. For the metals present in nonwastewater P and U wastes, potentially applicable treatment technologies are stabilization and high temperature metals recovery. Stabilization immobilizes the metal constituents to minimize leaching. High temperature metals recovery provides for recovery of metals from wastes primarily by volatilization of some of the metals, subsequent condensation, and collection. The process yields a metal product for reuse and reduces the amount of waste that needs to be land disposed. Additionally, most metallic nonwastewaters can be slurried such that metals can be recovered or treated using wastewater treatment techniques.

Wastewaters. The technologies applicable for reactive constituents present in a wastewater matrix are chemical precipitation and removal of the precipitated metal solids using settling or sludge filtration. Chemical precipitation removes dissolved metals from solution, and settling/sludge filtration removes suspended solids.

(3) **Applicable treatment technologies for inorganics other than metals**. The technologies identified as potentially applicable are those that destroy the compound or render it less harmful by removing the reactive characteristic.

Nonwastewaters. EPA has identified incineration as applicable for nonwastewaters and gases with inorganic reactive constituents other than metals. Incineration is a technology that can destroy oxidizable inorganics. Gases can be vented directly into the incinerator. It should be mentioned that off-gases generated during the incineration of these wastes may require an afterburner and/or may need to be scrubbed before release to the atmosphere.

Gases that cannot be combusted should be solubilized in water. The resulting compound present in aqueous scrubber solution should be precipitated as an insoluble innocuous compound.

Wastewaters. The technologies identified as applicable for P and U wastewaters containing reactive listing constituents are chemical oxidation methods (e.g., alkaline chlorination) followed by precipitation to insoluble salts or harmless compounds.

4.4.2 Demonstrated Treatment Technologies

EPA considered demonstrated technologies to be those that are used on a full-scale basis to treat the waste of interest or a similar waste with regard to parameters that affect treatment selection. To determine what treatment technologies are "demonstrated" for the reactive P and U codes, the Agency contacted both generators and treaters of the wastes (Rissmann 1989). The following are summaries for each investigation concerning the demonstrated treatment technologies for the individual reactive P and U wastes.

P006 - Aluminum phosphide - EPA contacted the only generator listed in the 1986 TSDR Survey to gather information about treatment. This company is also the only known producer; however, the company claims that it no longer produces aluminum phosphide. The Agency believes P122 zinc phosphide to be a similar waste based on physical and chemical characteristics. Incineration is demonstrated to treat P122. Consequently, the Agency believes incineration to be demonstrated to treat P006 nonwastewaters. Since this compound is water reactive, it is believed that wastewater forms cannot exist; however, phosphine, one of the products of decomposition, can be oxidized and precipitated with lime to form calcium phosphate.

P009 - Ammonium picrate - EPA could find no producers of this chemical listed in the SRI 1988 edition and no generators of the waste listed in the 1986 TSDR Survey. EPA believes that thermal destruction (i.e., open detonation) is the best treatment for this waste. Incineration was considered; however, because of the danger involved with the handling and treatment of this waste, incineration is not considered best. EPA believes that thermal destruction (i.e., open detonation) has been demonstrated to treat similar wastes; therefore, the Agency believes open detonation to be demonstrated to treat P009 wastewaters and nonwastewaters. Additionally, carbon adsorption has been demonstrated for similar wastewaters containing explosive nitro groups (i.e., the listed waste K045 is spent carbon from treatment of wastewaters from the production of nitrate esters and other nitrated explosives). Consequently, the Agency believes carbon adsorption is demonstrated to treat P009 wastewaters.

P015 - Beryllium dust - The Agency has identified a metallic beryllium producer that accepts beryllium wastes including P015 for recycling. The wastes are manifested directly to the facility since they have a RCRA storage permit. The facility usually only accepts beryllium wastes that are not highly contaminated. The wastes generally go through several proprietary processes to get rid of some of the contaminants (such as iron and lead); the waste is then added to the production process to make metallic beryllium. Additionally, for highly contaminated wastes, the facility has a vacuum cleaning process to recover beryllium from the dust. Hence, EPA believes that recovery is demonstrated to treat P015.

P056 - Fluorine - Two companies (in Pennsylvania and New Jersey) use alkaline scrubbers to react with waste fluorine gas, although each uses a different alkaline agent. One uses potassium hydroxide solution and then ships the spent solution to a commercial wastewater treatment plant for disposal. The other company uses a caustic soda (sodium hydroxide) solution in its scrubber, and when the resulting sodium fluoride concentration exceeds its solubility concentration (about 4.0 g/100 ml of water), the sodium fluoride is filtered out, drummed, and then shipped to a permitted disposer. Hence, solubilization in alkaline water is demonstrated to treat gaseous forms of P056. The Agency has also identified one facility using precipitation of fluoride as calcium fluoride (USEPA 1988f). Precipitation is demonstrated to treat P056 wastewaters.

P068 - Methyl hydrazine - EPA has found one commercial facility presently incinerating P068 nonwastewaters on a full-scale basis. Therefore, the Agency believes incineration to be demonstrated. The Agency has found one facility (NASA 1989) using an ozone/ultraviolet light oxidation treatment system for destruction of methyl hydrazines in a dilute aqueous solution (<100 ppm methyl hydrazine). The facility uses total organic carbon (TOC) and some intermediate products to monitor and evaluate the sytem; therefore, the Agency believes ozone/ultraviolet light to be demonstrated for the dilute wastewater forms of P068. However, the Agency believes the oxidation process should be followed with carbon adsorption as a polishing step for removal because the oxidation treatment has been demonstrated only for dilute wastewaters. Carbon adsorption has been demonstrated on similar wastes. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, large molecular weights, and low solubility in water. Therefore, EPA believes carbon adsorption is demonstrated for P068 wastewaters. Following adsorption, the resulting nonwastewater carbon residual must be incinerated.

P073 - Nickel carbonyl - EPA contacted a nickel smelter that uses the Mond process to purify nickel (Bell 1989). During the Mond process, nickel carbonyl is passed through a heated bed of alumina at 200°C to recover nickel. The heat and alumina catalyst cause the nickel carbonyl to decompose into nickel and carbon dioxide. The carbon dioxide is fed to an incinerator and destroyed. EPA believes that for wastewater and nonwastewater forms of P073, nickel recovery using the Mond process is the best technology.

P081 - Nitroglycerin - The Agency has found one facility using thermal destruction (i.e., open burning) for treatment of nonwastewater forms of a nitroglycerin waste. EPA has determined that one facility is using rotary kiln incineration for treatment of nitroglycerin wastewaters and nonwastewater slurries. EPA believes thermal destruction (i.e., open burning) and incineration are demonstrated for nonwastewaters and that incineration is demonstrated for wastewaters. Additionally, carbon adsorption has been demonstrated for similar wastewaters containing explosive nitro groups (i.e., the listed waste K045 is spent carbon for treatment of wastewaters from the production of nitrate esters and other nitrated explosives). Consequently, the Agency believes carbon adsorption is demonstrated to treat P081 wastewaters, as well as incineration.

P087 - Osmium tetroxide - EPA has found one facility that bench treated an aqueous solution of osmium tetroxide with potassium iodide to precipitate the osmium metal. The metal was recovered and sent to a producer of osmium chemicals. (Osmium is presently valued at $1,350 per ounce so it is unlikely that anyone is discarding the material.) According to the 1986 Minerals Yearbook, only 2 pounds of osmium tetroxide were produced; therefore, the Agency believes it appropriate to use bench-scale performance data. Hence, recovery is a demonstrated technology for wastewater forms. Similar nonwastewaters have been slurried and treated as stated above; therefore, the Agency believes precipitation followed by recovery of the osmium to be demonstrated for nonwastewater forms.

P096 - Phosphine - The Agency believes that it is common practice to incinerate phosphine to phosphorus pentoxide and scrub the off-gas with lime solution to generate calcium phosphate. This scrubber water can be treated with neutralization. Hence, the Agency considers incineration to be demonstrated to treat phosphine gas and chemical oxidation followed by precipitation to be demonstrated to treat P096 wastewaters.

P105 - Sodium azide - EPA has found one facility using incineration for treatment of P105 nonwastewaters; therefore, the Agency has concluded that incineration is demonstrated for nonwastewaters.

Nitrite treatment can be accomplished by adding sodium nitrite to sodium azide to produce nitrogen and sodium hydroxide. This treatment is currently used by a facility for treatment of lead azide. Lead azide is believed to be a similar waste based on chemical properties; consequently, the Agency considers chemical oxidation to be demonstrated to treat P105 wastewaters.

P112 - Tetranitromethane - EPA has found one commercial facility incinerating dilute concentrations of P112. This facility claims that the waste is sufficiently stable when blended with other wastes to form a dilute mixture that can be incinerated. Hence, incineration is demonstrated to treat P112 wastewaters and nonwastewaters. Additionally, carbon adsorption has been demonstrated for similar wastewaters containing explosive nitro groups (i.e., the listed waste K045 is spent carbon for treatment of wastewaters from the production of nitrate esters and other nitrated explosives). Consequently, the Agency considers carbon adsorption to be demonstrated to treat P112 wastewaters.

P122 - Zinc phosphide (>10%) - EPA has found one commercial facility using incineration for treatment of P122 nonwastewaters and consequently believes that incineration is demonstrated. Since this compound reacts with water, it is believed that wastewater forms cannot exist; however, the dissociated zinc can be precipitated with lime.

U023 - Benzotrichloride - EPA has found one commercial facility using incineration for treatment of U023 nonwastewaters and consequently believes that incineration is demonstrated. Since this compound reacts with water, it is believed that wastewater forms cannot exist; however, carbon absorption has been demonstrated to treat benzoic acid, which is one of the products formed by the reaction of benzotrichloride with water.

U086 - N,N-Diethylhydrazine - EPA has found one commercial facility using incineration for treatment of U086 nonwastewaters and consequently believes that incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that U086 wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency believes carbon adsorption to be demonstrated for these wastewaters.

U096 - a,a-dimethylbenzylhydroperoxide - EPA has found one commercial facility using incineration for treatment of U096 nonwastewaters; hence, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U098 - 1,1-Dimethylhydrazine - EPA has found one commercial facility using incineration for treatment of U098 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, large molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U099 - 1,2-Dimethylhydrazine - EPA has found one commercial facility using incineration for treatment of U099 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U103 - Dimethyl sulfate - EPA has found one commercial facility using incineration for treatment of U103 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U109 - 1,2-Diphenylhydrazine - EPA has found one commercial facility using incineration for treatment of U109 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U133 - Hydrazine - EPA has found one commercial facility using incineration for treatment of U133 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U134 - Hydrogen fluoride - The disposal of hydrogen fluoride is similar to the disposal of fluorine. In fact, the same scrubbing equipment and the same alkaline scrubbing solutions are used by two facilities for both waste fluorine and waste hydrogen fluoride. Two other facilities utilize scrubbing, or a variation of scrubbing, for their waste hydrogen fluoride gas but do not scrub fluorine. A fifth vendor uses recovery and recycle techniques on its gas cylinders, but its situation is a special one because its locations deal only in 850-pound, 1-ton, and 20-ton containers. With such large containers, recovery and recycle is the most technically feasible practice. Because four companies use alkaline scrubbing and one uses product recovery and recycle, these are demonstrated technologies.

U135 - Hydrogen sulfide - It is common practice to incinerate hydrogen sulfide, which will generate sulfur dioxide off-gas. The off-gas can be scrubbed with alkaline solution to generate calcium sulfate. Hence, the Agency believes that incineration is demonstrated to treat hydrogen sulfide gas and that chemical oxidation of any sulfide to sulfate followed by precipitation is demonstrated to treat U135 wastewaters.

U160 - Methyl ethyl ketone peroxide - One facility reportedly uses open burning to treat U160 nonwastewaters. EPA has also found one commercial facility using incineration for treatment of U160 nonwastewaters; therefore, both technologies are demonstrated to treat U160 nonwastewaters. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U189 - Phosphorus sulfide - EPA has found one commercial facility using incineration for treatment of U189 nonwastewaters; hence, incineration is demonstrated. This compound reacts with water, and consequently it is believed that wastewater forms cannot exit.

U249 - Zinc phosphide (<10%) - EPA has found one commercial facility using incineration for treatment of U249 nonwastewaters; hence, incineration is demonstrated. Since this constituent is water reactive, it is believed that wastewater forms cannot exit; however, the dissociated zinc can be precipitated with lime.

4.5 Identification of Best Demonstrated Available Technology (BDAT)

This section presents the rationale for determination of best demonstrated available technology (BDAT) for each reactive P and U waste. First, the Agency examines all the demonstrated technologies to determine whether one of the technologies performs significantly better than another. Next, the "best" performing treatment technology is evaluated to determine whether the resulting treatment is "substantial." Since EPA does not have performance data for any of these wastes and because of the lack of analytical methods, the Agency's evaluation of "substantial" is based on the performance of technologies established in the Agency's BDAT data base. If the "best" technology provides "substantial" treatment and it has been determined that the technology is also commercially available to the affected industry, then the technology represents BDAT.

The Agency investigated several options for developing treatment standards for these wastes, including incineration, open burning, open detonation, and chemical deactivation. Because of the difficulties in handling and chemically analyzing these wastes, however, the Agency is proposing treatment standards expressed as required methods of treatment, not concentration-based standards. Most of the nonwastewater forms of these wastes are currently managed by incineration. Other wastes included in this group can be recovered or recycled.

The Agency is unaware of any alternative treatment or recycling technologies that have been examined specifically for the U and P wastes, with the exception of the recoverable metals discussed previously. In any case, today's proposed treatment standards do not preclude recycling, provided the recycling does not involve burning as fuel or use constituting disposal.

For the purpose of BDAT determinations, the Agency has identified four subgroups according to similarities in treatment, chemical composition, and structure. These groups are Incinerable Reactive Organics and Hydrazine Derivatives, Incinerable Inorganics, Fluorine

Compounds, and Recoverable Metallics. The discussion of the treatment standards applicable to each subgroup follows. Table 4-1 located at the end of this chapter summarizes the treatment standards for P and U wastes containing reactive listing constituents.

Recently, additional wastewater treatment data primarily from EPA's Office of Water have been analyzed for the development of concentration-based treatment standards for many of the U and P wastes. These data include the treatment of wastewaters that are not specifically listed as U or P wastewaters, but do contain many of the corresponding U or P constituents. While these data were not available in time to incorporate into the preamble discussion or into individual background documents for specific wastes or waste groups, these data are being placed in the administrative record for today's notice. Furthermore, the Agency has decided to propose alternative concentration-based treatment standards, based on the aforementioned data for wastewaters containing fluoride and sulfide. Further information on these alternative standards can be found in sections III.A.2.a.(3.) and III.A.1.h.(b.) of the preamble for the proposed rule and in the document Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents which can be found in the RCRA docket.

4.5.1 BDAT for Incinerable Reactive Organic and Hydrazine Derivatives

The following constituents have been grouped together because they are organic constituents that can be incinerated:

P009 - Ammonium picrate
P081 - Nitroglycerine
P112 - Tetranitromethane
U023 - Benzotrichloride
U096 - a,a-Dimethylbenzylhydroperoxide
U103 - Dimethyl sulfate
U160 - Methyl ethyl ketone peroxide

P068 - Methyl hydrazine
U086 - 1,2-Diethylhydrazine
U098 - 1,1-Dimethylhydrazine
U099 - 1,2-Dimethylhydrazine
U109 - 1,2-Diphenylhydrazine
U133 - Hydrazine

Nonwastewaters. The Agency has identified incineration and thermal destruction (i.e., open burning and open detonation) as a demonstrated technology for treatment of reactive organic constituents. However, there are certain disadvantages to using open burning and open detonation disposal practices, which present the potential for some degree of adverse environmental impacts. The degree of any impact would depend on factors such as the types and quantities of items that are disposed of by using open burning and open detonation, the hydrogeology and topography of the site, the climatology in the area, and the operating procedures and management practices used. The potential types of impact would result in air, water, soil, and/or noise pollution.

Incineration is considered commercially available, and it provides substantially better treatment than thermal destruction (i.e., open burning and open detonation) for treatment of most reactive organic constituents; therefore, it is also considered "best." For highly explosive wastes, thermal destruction (i.e., open burning and open detonation) is presently the only method commercially available for deactivation treatment; therefore, it is "best."

Many of the U and P wastes exist as concentrated off-specification chemicals. Depending on other constituents present in the waste matrix, these off-spec chemicals could potentially be dissolved in a suitable waste solvent and incinerated in a liquid injection system. There is, however, risk associated with dissolving these highly reactive chemicals; therefore, incineration without dissolving in a rotary kiln may be preferable (although this proposed treatment standard allows for any method of incineration). EPA is not precluding the dissolution of these chemicals. In cases where there is a significant volume of these chemicals, dissolution in a solvent may be necessary to reduce air emissions or to reduce the risk of explosion.

Since the analytical problems preclude setting concentration-based treatment standards for most of the waste codes, and RCRA section 3004(m) allows the Agency to establish either levels or methods of treatment, the Agency is proposing "Thermal Destruction as a Method of Treatment" (e.g., incineration) for the nonwastewater forms of these U and P wastes. Although there is an SW-846 method for U109, the Agency is not proposing a numerical standard for this waste since it is very similar to P068, U086, U098, U099, and U133 (all are hydrazine compounds). There are no performance data from which to establish numerical standards, and it is the Agency's belief that thermal destruction will be effective treatment for this waste.

Incinerators burning any RCRA hazardous waste must meet the requirements specified in 40 CFR Part 264 Subpart O or Part 265 Subpart O. Therefore, combustion units used for treating these wastes must be equipped with air pollution control devices that will adequately control the combustion products and air emissions.

Wastewaters. The Agency has determined that carbon adsorption is demonstrated technology for treatment of wastewaters containing reactive organic constituents. Carbon adsorption is demonstrated, is available, and provides substantial treatment; it is therefore considered "best." Additionally, for wastewaters containing high concentrations of constituents, incineration is demonstrated, available, and therefore "best."

The Agency is proposing "Incineration or Carbon Adsorption as a Method of Treatment" for the wastewater forms of this group of U and P wastes. It is important to mention that this standard does not preclude the use of other treatments such as biological or ozonation before the use of carbon adsorption. The Agency believes that other wastewater technologies should be used before carbon adsorption, when applicable, to aid with the waste treatment. After adsorption (and before disposal), the contaminated carbon must be incinerated (in compliance with the proposed treatment standard for nonwastewaters).

4.5.2 BDAT for Incinerable Inorganics

The following constituents have been grouped together because they consist of compounds containing sulfur, nitrogen, and phosphorus.

P006 - Aluminum phosphide
P096 - Phosphine
P105 - Sodium azide
P122 - Zinc phosphide (>10%)
U135 - Hydrogen sulfide
U189 - Phosphorus sulfide
U249 - Zinc phosphide (<10%)

__Nonwastewaters__. The only demonstrated technology available for nonwastewaters containing the reactive P and U listing constituents listed above is incineration. Incineration has been proved to provide substantial reduction and is also commercially available; hence, it is "best."

The Agency is proposing a treatment standard of "Thermal Destruction as a Method of Treatment" for the nonwastewater forms of these wastes. These wastes may contain high concentrations of sulfur and phosphorus when discarded as off-spec products, making their treatment more difficult. Incineration of these wastes will require the use of air pollution control equipment capable of controlling the emissions of phosphorus and sulfur to acceptable levels.

__Wastewaters__. The Agency has identified chemical oxidation followed by precipitation to insoluble salts as a demonstrated technology for treatment of wastewater forms. Most of these compounds decompose in water and the products of decomposition can be treated using oxidation followed by precipitation. Chemical oxidation and precipitation provide substantial reduction of oxidizable constituents and are also commercially available and hence the "best" technology train.

The Agency is proposing a treatment standard of "Chemical Oxidation Followed by Precipitation to Insoluble Salts as a Method of Treatment" for the wastewater forms of these wastes.

4.5.3 BDAT for Fluorine Compounds

The following constituents were grouped together because of their physical form and because they contain fluorine.

P056 - Fluorine
U134 - Hydrofluoric Acid

Both of these wastes can exist as gases and gases solubilized in wastewaters (although U134 is often generated as an aqueous acid). In the gaseous form, alkaline scrubbing has been demonstrated to treat P056 and U134, although recycle and recovery can be used when applicable for some containerized gases. For P056 and U134 wastewaters, neutralization is a demonstrated technology. When fluoride ion is to be neutralized or removed, it is advantageous to use calcium compounds since the resulting salt (CaF_2) is insoluble compared to other compounds and can be removed fairly easily by simple filtration. For example, the solubility of calcium fluoride is 0.0015 g per 100 ml water and the solubility of sodium fluoride is 4.22 g per 100 ml water at 18°C. For the fluorine wastes, the Agency is proposing "Solubilization in Alkaline Water Followed by Precipitation as Calcium Fluoride; or Recovery as Methods of Treatment."

4.5.4 BDAT for Recoverable Metallics

All the wastes in this group contain metallic elements (i.e., beryllium, osmium, and nickel) that can be recovered because of their high economic value. Information available to the Agency indicates that recovery of these metallic elements from these wastes is feasible and is currently practiced.

P015 - Beryllium dust
P073 - Nickel carbonyl
P087 - Osmium tetroxide

Nonwastewaters. The Agency has identified recovery as the only demonstrated technology for treatment of reactive P and U metal constituents and nonwastewaters. Recovery is commercially available and provides substantial treatment; hence, it is "best." The Agency is proposing a standard of "Recovery as a Method of Treatment" for nonwastewater forms of these wastes.

Wastewaters. The Agency has identified precipitation followed by recovery of the metal as the only demonstrated treatment of wastewaters containing these reactive P and U metal constituents. Recovery provides substantial reduction and is commercially available and therefore "best." The Agency is proposing a standard of "Recovery as a Method of Treatment" for wastewater forms of these wastes.

TABLE 4-1 BDAT TREATMENT STANDARDS FOR P AND U WASTES CONTAINING REACTIVE LISTING CONSTITUENTS

BDAT TREATMENT STANDARDS FOR P009, P068, P081, P112, U023,
U086, U096, U098, U099, U103, U109, U133, AND U160
[Wastewaters]

INCINERATION OR CARBON ADSORPTION AS METHODS OF TREATMENT

BDAT TREATMENT STANDARDS FOR P009, P068, P081, P112, U023,
U086, U096, U098, U099, U103, U109, U133, AND U160
[Nonwastewaters]

THERMAL DESTRUCTION AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR
P006, P096, P105, P122, U135, U189, AND U249
[Wastewaters]

CHEMICAL OXIDATION FOLLOWED BY PRECIPITATION TO INSOLUBLE SALTS AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR
P006, P096, P105, P122, U135, U189, AND U249
[Nonwastewaters]

THERMAL DESTRUCTION AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR P056 AND U134
[Nonwastewaters and Wastewaters]

SOLUBILIZATION IN WATER FOLLOWED BY PRECIPITATION AS CALCIUM FLUORIDE; OR RECOVERY AS METHODS OF TREATMENT

BDAT TREATMENT STANDARDS FOR P015, P073, AND P087
[Nonwastewaters and Wastewaters]

RECOVERY AS A METHOD OF TREATMENT

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P015 - Beryllium dust - The Agency has identified a metallic beryllium producer that accepts beryllium wastes including P015 for recycling. The wastes are manifested directly to the facility since they have a RCRA storage permit. The facility usually only accepts beryllium wastes that are not highly contaminated. The wastes generally go through several proprietary processes to get rid of some of the contaminants (such as iron and lead); the waste is then added to the production process to make metallic beryllium. Additionally, for highly contaminated wastes, the facility has a vacuum cleaning process to recover beryllium from the dust. Hence, EPA believes that recovery is demonstrated to treat P015.

P056 - Fluorine - Two companies (in Pennsylvania and New Jersey) use alkaline scrubbers to react with waste fluorine gas, although each uses a different alkaline agent. One uses potassium hydroxide solution and then ships the spent solution to a commercial wastewater treatment plant for disposal. The other company uses a caustic soda (sodium hydroxide) solution in its scrubber, and when the resulting sodium fluoride concentration exceeds its solubility concentration (about 4.0 g/100 ml of water), the sodium fluoride is filtered out, drummed, and then shipped to a permitted disposer. Hence, solubilization in alkaline water is demonstrated to treat gaseous forms of P056. The Agency has also identified one facility using precipitation of fluoride as calcium fluoride (USEPA 1988f). Precipitation is demonstrated to treat P056 wastewaters.

P068 - Methyl hydrazine - EPA has found one commercial facility presently incinerating P068 nonwastewaters on a full-scale basis. Therefore, the Agency believes incineration to be demonstrated. The Agency has found one facility (NASA 1989) using an ozone/ultraviolet light oxidation treatment system for destruction of methyl hydrazines in a dilute aqueous solution (<100 ppm methyl hydrazine). The facility uses total organic carbon (TOC) and some intermediate products to monitor and evaluate the sytem; therefore, the Agency believes ozone/ultraviolet light to be demonstrated for the dilute wastewater forms of P068. However, the Agency believes the oxidation process should be followed with carbon adsorption as a polishing step for removal because the oxidation treatment has been demonstrated only for dilute wastewaters. Carbon adsorption has been demonstrated on similar wastes. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, large molecular weights, and low solubility in water. Therefore, EPA believes carbon adsorption is demonstrated for P068 wastewaters. Following adsorption, the resulting nonwastewater carbon residual must be incinerated.

P073 - Nickel carbonyl - EPA contacted a nickel smelter that uses the Mond process to purify nickel (Bell 1989). During the Mond process, nickel carbonyl is passed through a heated bed of alumina at 200°C to recover nickel. The heat and alumina catalyst cause the nickel carbonyl to decompose into nickel and carbon dioxide. The carbon dioxide is fed to an incinerator and destroyed. EPA believes that for wastewater and nonwastewater forms of P073, nickel recovery using the Mond process is the best technology.

P081 - Nitroglycerin - The Agency has found one facility using thermal destruction (i.e., open burning) for treatment of nonwastewater forms of a nitroglycerin waste. EPA has determined that one facility is using rotary kiln incineration for treatment of nitroglycerin wastewaters and nonwastewater slurries. EPA believes thermal destruction (i.e., open burning) and incineration are demonstrated for nonwastewaters and that incineration is demonstrated for wastewaters. Additionally, carbon adsorption has been demonstrated for similar wastewaters containing explosive nitro groups (i.e., the listed waste K045 is spent carbon for treatment of wastewaters from the production of nitrate esters and other nitrated explosives). Consequently, the Agency believes carbon adsorption is demonstrated to treat P081 wastewaters, as well as incineration.

P087 - Osmium tetroxide - EPA has found one facility that bench treated an aqueous solution of osmium tetroxide with potassium iodide to precipitate the osmium metal. The metal was recovered and sent to a producer of osmium chemicals. (Osmium is presently valued at $1,350 per ounce so it is unlikely that anyone is discarding the material.) According to the 1986 Minerals Yearbook, only 2 pounds of osmium tetroxide were produced; therefore, the Agency believes it appropriate to use bench-scale performance data. Hence, recovery is a demonstrated technology for wastewater forms. Similar nonwastewaters have been slurried and treated as stated above; therefore, the Agency believes precipitation followed by recovery of the osmium to be demonstrated for nonwastewater forms.

P096 - Phosphine - The Agency believes that it is common practice to incinerate phosphine to phosphorus pentoxide and scrub the off-gas with lime solution to generate calcium phosphate. This scrubber water can be treated with neutralization. Hence, the Agency considers incineration to be demonstrated to treat phosphine gas and chemical oxidation followed by precipitation to be demonstrated to treat P096 wastewaters.

P105 - Sodium azide - EPA has found one facility using incineration for treatment of P105 nonwastewaters; therefore, the Agency has concluded that incineration is demonstrated for nonwastewaters.

Nitrite treatment can be accomplished by adding sodium nitrite to sodium azide to produce nitrogen and sodium hydroxide. This treatment is currently used by a facility for treatment of lead azide. Lead azide is believed to be a similar waste based on chemical properties; consequently, the Agency considers chemical oxidation to be demonstrated to treat P105 wastewaters.

P112 - Tetranitromethane - EPA has found one commercial facility incinerating dilute concentrations of P112. This facility claims that the waste is sufficiently stable when blended with other wastes to form a dilute mixture that can be incinerated. Hence, incineration is demonstrated to treat P112 wastewaters and nonwastewaters. Additionally, carbon adsorption has been demonstrated for similar wastewaters containing explosive nitro groups (i.e., the listed waste K045 is spent carbon for treatment of wastewaters from the production of nitrate esters and other nitrated explosives). Consequently, the Agency considers carbon adsorption to be demonstrated to treat P112 wastewaters.

P122 - Zinc phosphide (>10%) - EPA has found one commercial facility using incineration for treatment of P122 nonwastewaters and consequently believes that incineration is demonstrated. Since this compound reacts with water, it is believed that wastewater forms cannot exist; however, the dissociated zinc can be precipitated with lime.

U023 - Benzotrichloride - EPA has found one commercial facility using incineration for treatment of U023 nonwastewaters and consequently believes that incineration is demonstrated. Since this compound reacts with water, it is believed that wastewater forms cannot exist; however, carbon absorption has been demonstrated to treat benzoic acid, which is one of the products formed by the reaction of benzotrichloride with water.

U086 - N,N-Diethylhydrazine - EPA has found one commercial facility using incineration for treatment of U086 nonwastewaters and consequently believes that incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that U086 wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency believes carbon adsorption to be demonstrated for these wastewaters.

U096 - a,a-dimethylbenzylhydroperoxide - EPA has found one commercial facility using incineration for treatment of U096 nonwastewaters; hence, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U098 - 1,1-Dimethylhydrazine - EPA has found one commercial facility using incineration for treatment of U098 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, large molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U099 - 1,2-Dimethylhydrazine - EPA has found one commercial facility using incineration for treatment of U099 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U103 - Dimethyl sulfate - EPA has found one commercial facility using incineration for treatment of U103 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U109 - 1,2-Diphenylhydrazine - EPA has found one commercial facility using incineration for treatment of U109 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U133 - Hydrazine - EPA has found one commercial facility using incineration for treatment of U133 nonwastewaters; therefore, incineration is demonstrated. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures, high molecular weights, and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U134 - Hydrogen fluoride - The disposal of hydrogen fluoride is similar to the disposal of fluorine. In fact, the same scrubbing equipment and the same alkaline scrubbing solutions are used by two facilities for both waste fluorine and waste hydrogen fluoride. Two other facilities utilize scrubbing, or a variation of scrubbing, for their waste hydrogen fluoride gas but do not scrub fluorine. A fifth vendor uses recovery and recycle techniques on its gas cylinders, but its situation is a special one because its locations deal only in 850-pound, 1-ton, and 20-ton containers. With such large containers, recovery and recycle is the most technically feasible practice. Because four companies use alkaline scrubbing and one uses product recovery and recycle, these are demonstrated technologies.

U135 - Hydrogen sulfide - It is common practice to incinerate hydrogen sulfide, which will generate sulfur dioxide off-gas. The off-gas can be scrubbed with alkaline solution to generate calcium sulfate. Hence, the Agency believes that incineration is demonstrated to treat hydrogen sulfide gas and that chemical oxidation of any sulfide to sulfate followed by precipitation is demonstrated to treat U135 wastewaters.

U160 - Methyl ethyl ketone peroxide - One facility reportedly uses open burning to treat U160 nonwastewaters. EPA has also found one commercial facility using incineration for treatment of U160 nonwastewaters; therefore, both technologies are demonstrated to treat U160 nonwastewaters. Carbon adsorption has been demonstrated on similar wastewaters. The Agency believes that these wastewaters can be easily adsorbed because of the branched nature of their structures and low solubility in water. Therefore, the Agency considers carbon adsorption to be demonstrated for these wastewaters.

U189 - Phosphorus sulfide - EPA has found one commercial facility using incineration for treatment of U189 nonwastewaters; hence, incineration is demonstrated. This compound reacts with water, and consequently it is believed that wastewater forms cannot exit.

U249 - Zinc phosphide (<10%) - EPA has found one commercial facility using incineration for treatment of U249 nonwastewaters; hence, incineration is demonstrated. Since this constituent is water reactive, it is believed that wastewater forms cannot exit; however, the dissociated zinc can be precipitated with lime.

4.5 Identification of Best Demonstrated Available Technology (BDAT)

This section presents the rationale for determination of best demonstrated available technology (BDAT) for each reactive P and U waste. First, the Agency examines all the demonstrated technologies to determine whether one of the technologies performs significantly better than another. Next, the "best" performing treatment technology is evaluated to determine whether the resulting treatment is "substantial." Since EPA does not have performance data for any of these wastes and because of the lack of analytical methods, the Agency's evaluation of "substantial" is based on the performance of technologies established in the Agency's BDAT data base. If the "best" technology provides "substantial" treatment and it has been determined that the technology is also commercially available to the affected industry, then the technology represents BDAT.

The Agency investigated several options for developing treatment standards for these wastes, including incineration, open burning, open detonation, and chemical deactivation. Because of the difficulties in handling and chemically analyzing these wastes, however, the Agency is proposing treatment standards expressed as required methods of treatment, not concentration-based standards. Most of the nonwastewater forms of these wastes are currently managed by incineration. Other wastes included in this group can be recovered or recycled.

The Agency is unaware of any alternative treatment or recycling technologies that have been examined specifically for the U and P wastes, with the exception of the recoverable metals discussed previously. In any case, today's proposed treatment standards do not preclude recycling, provided the recycling does not involve burning as fuel or use constituting disposal.

For the purpose of BDAT determinations, the Agency has identified four subgroups according to similarities in treatment, chemical composition, and structure. These groups are Incinerable Reactive Organics and Hydrazine Derivatives, Incinerable Inorganics, Fluorine

Compounds, and Recoverable Metallics. The discussion of the treatment standards applicable to each subgroup follows. Table 4-1 located at the end of this chapter summarizes the treatment standards for P and U wastes containing reactive listing constituents.

Recently, additional wastewater treatment data primarily from EPA's Office of Water have been analyzed for the development of concentration-based treatment standards for many of the U and P wastes. These data include the treatment of wastewaters that are not specifically listed as U or P wastewaters, but do contain many of the corresponding U or P constituents. While these data were not available in time to incorporate into the preamble discussion or into individual background documents for specific wastes or waste groups, these data are being placed in the administrative record for today's notice. Furthermore, the Agency has decided to propose alternative concentration-based treatment standards, based on the aforementioned data for wastewaters containing fluoride and sulfide. Further information on these alternative standards can be found in sections III.A.2.a.(3.) and III.A.1.h.(b.) of the preamble for the proposed rule and in the document Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents which can be found in the RCRA docket.

4.5.1 BDAT for Incinerable Reactive Organic and Hydrazine Derivatives

The following constituents have been grouped together because they are organic constituents that can be incinerated:

P009 - Ammonium picrate
P081 - Nitroglycerine
P112 - Tetranitromethane
U023 - Benzotrichloride
U096 - a,a-Dimethylbenzylhydroperoxide
U103 - Dimethyl sulfate
U160 - Methyl ethyl ketone peroxide
P068 - Methyl hydrazine
U086 - 1,2-Diethylhydrazine
U098 - 1,1-Dimethylhydrazine
U099 - 1,2-Dimethylhydrazine
U109 - 1,2-Diphenylhydrazine
U133 - Hydrazine

Nonwastewaters. The Agency has identified incineration and thermal destruction (i.e., open burning and open detonation) as a demonstrated technology for treatment of reactive organic constituents. However, there are certain disadvantages to using open burning and open detonation disposal practices, which present the potential for some degree of adverse environmental impacts. The degree of any impact would depend on factors such as the types and quantities of items that are disposed of by using open burning and open detonation, the hydrogeology and topography of the site, the climatology in the area, and the operating procedures and management practices used. The potential types of impact would result in air, water, soil, and/or noise pollution.

Incineration is considered commercially available, and it provides substantially better treatment than thermal destruction (i.e., open burning and open detonation) for treatment of most reactive organic constituents; therefore, it is also considered "best." For highly explosive wastes, thermal destruction (i.e., open burning and open detonation) is presently the only method commercially available for deactivation treatment; therefore, it is "best."

Many of the U and P wastes exist as concentrated off-specification chemicals. Depending on other constituents present in the waste matrix, these off-spec chemicals could potentially be dissolved in a suitable waste solvent and incinerated in a liquid injection system. There is, however, risk associated with dissolving these highly reactive chemicals; therefore, incineration without dissolving in a rotary kiln may be preferable (although this proposed treatment standard allows for any method of incineration). EPA is not precluding the dissolution of these chemicals. In cases where there is a significant volume of these chemicals, dissolution in a solvent may be necessary to reduce air emissions or to reduce the risk of explosion.

Since the analytical problems preclude setting concentration-based treatment standards for most of the waste codes, and RCRA section 3004(m) allows the Agency to establish either levels or methods of treatment, the Agency is proposing "Thermal Destruction as a Method of Treatment" (e.g., incineration) for the nonwastewater forms of these U and P wastes. Although there is an SW-846 method for U109, the Agency is not proposing a numerical standard for this waste since it is very similar to P068, U086, U098, U099, and U133 (all are hydrazine compounds). There are no performance data from which to establish numerical standards, and it is the Agency's belief that thermal destruction will be effective treatment for this waste.

Incinerators burning any RCRA hazardous waste must meet the requirements specified in 40 CFR Part 264 Subpart O or Part 265 Subpart O. Therefore, combustion units used for treating these wastes must be equipped with air pollution control devices that will adequately control the combustion products and air emissions.

Wastewaters. The Agency has determined that carbon adsorption is demonstrated technology for treatment of wastewaters containing reactive organic constituents. Carbon adsorption is demonstrated, is available, and provides substantial treatment; it is therefore considered "best." Additionally, for wastewaters containing high concentrations of constituents, incineration is demonstrated, available, and therefore "best."

The Agency is proposing "Incineration or Carbon Adsorption as a Method of Treatment" for the wastewater forms of this group of U and P wastes. It is important to mention that this standard does not preclude the use of other treatments such as biological or ozonation before the use of carbon adsorption. The Agency believes that other wastewater technologies should be used before carbon adsorption, when applicable, to aid with the waste treatment. After adsorption (and before disposal), the contaminated carbon must be incinerated (in compliance with the proposed treatment standard for nonwastewaters).

4.5.2 BDAT for Incinerable Inorganics

The following constituents have been grouped together because they consist of compounds containing sulfur, nitrogen, and phosphorus.

P006 - Aluminum phosphide
P096 - Phosphine
P105 - Sodium azide
P122 - Zinc phosphide (>10%)
U135 - Hydrogen sulfide
U189 - Phosphorus sulfide
U249 - Zinc phosphide (<10%)

Nonwastewaters. The only demonstrated technology available for nonwastewaters containing the reactive P and U listing constituents listed above is incineration. Incineration has been proved to provide substantial reduction and is also commercially available; hence, it is "best."

The Agency is proposing a treatment standard of "Thermal Destruction as a Method of Treatment" for the nonwastewater forms of these wastes. These wastes may contain high concentrations of sulfur and phosphorus when discarded as off-spec products, making their treatment more difficult. Incineration of these wastes will require the use of air pollution control equipment capable of controlling the emissions of phosphorus and sulfur to acceptable levels.

Wastewaters. The Agency has identified chemical oxidation followed by precipitation to insoluble salts as a demonstrated technology for treatment of wastewater forms. Most of these compounds decompose in water and the products of decomposition can be treated using oxidation followed by precipitation. Chemical oxidation and precipitation provide substantial reduction of oxidizable constituents and are also commercially available and hence the "best" technology train.

The Agency is proposing a treatment standard of "Chemical Oxidation Followed by Precipitation to Insoluble Salts as a Method of Treatment" for the wastewater forms of these wastes.

4.5.3 BDAT for Fluorine Compounds

The following constituents were grouped together because of their physical form and because they contain fluorine.

P056 - Fluorine
U134 - Hydrofluoric Acid

Both of these wastes can exist as gases and gases solubilized in wastewaters (although U134 is often generated as an aqueous acid). In the gaseous form, alkaline scrubbing has been demonstrated to treat P056 and U134, although recycle and recovery can be used when applicable for some containerized gases. For P056 and U134 wastewaters, neutralization is a demonstrated technology. When fluoride ion is to be neutralized or removed, it is advantageous to use calcium compounds since the resulting salt (CaF_2) is insoluble compared to other compounds and can be removed fairly easily by simple filtration. For example, the solubility of calcium fluoride is 0.0015 g per 100 ml water and the solubility of sodium fluoride is 4.22 g per 100 ml water at 18°C. For the fluorine wastes, the Agency is proposing "Solubilization in Alkaline Water Followed by Precipitation as Calcium Fluoride; or Recovery as Methods of Treatment."

4.5.4 BDAT for Recoverable Metallics

All the wastes in this group contain metallic elements (i.e., beryllium, osmium, and nickel) that can be recovered because of their high economic value. Information available to the Agency indicates that recovery of these metallic elements from these wastes is feasible and is currently practiced.

P015 - Beryllium dust
P073 - Nickel carbonyl
P087 - Osmium tetroxide

Nonwastewaters. The Agency has identified recovery as the only demonstrated technology for treatment of reactive P and U metal constituents and nonwastewaters. Recovery is commercially available and provides substantial treatment; hence, it is "best." The Agency is proposing a standard of "Recovery as a Method of Treatment" for nonwastewater forms of these wastes.

Wastewaters. The Agency has identified precipitation followed by recovery of the metal as the only demonstrated treatment of wastewaters containing these reactive P and U metal constituents. Recovery provides substantial reduction and is commercially available and therefore "best." The Agency is proposing a standard of "Recovery as a Method of Treatment" for wastewater forms of these wastes.

TABLE 4-1 BDAT TREATMENT STANDARDS FOR P AND U WASTES CONTAINING REACTIVE LISTING CONSTITUENTS

BDAT TREATMENT STANDARDS FOR P009, P068, P081, P112, U023, U086, U096, U098, U099, U103, U109, U133, AND U160
[Wastewaters]

INCINERATION OR CARBON ADSORPTION AS METHODS OF TREATMENT

BDAT TREATMENT STANDARDS FOR P009, P068, P081, P112, U023, U086, U096, U098, U099, U103, U109, U133, AND U160
[Nonwastewaters]

THERMAL DESTRUCTION AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR
P006, P096, P105, P122, U135, U189, AND U249
[Wastewaters]

CHEMICAL OXIDATION FOLLOWED BY PRECIPITATION TO INSOLUBLE SALTS AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR
P006, P096, P105, P122, U135, U189, AND U249
[Nonwastewaters]

THERMAL DESTRUCTION AS A METHOD OF TREATMENT

BDAT TREATMENT STANDARDS FOR P056 AND U134
[Nonwastewaters and Wastewaters]

SOLUBILIZATION IN WATER FOLLOWED BY PRECIPITATION AS CALCIUM FLUORIDE; OR RECOVERY AS METHODS OF TREATMENT

BDAT TREATMENT STANDARDS FOR P015, P073, AND P087
[Nonwastewaters and Wastewaters]

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APPENDIX A

WASTE CHARACTERIZATION AND INDUSTRIAL DESCRIPTIONS FOR D001 WASTES

Table A-1 Characterization and Industry Data for D001 Wastes That Are Only Characteristic Ignitable Wastes (i.e., not mixed with other hazardous wastes) According to the 1986 TSDR Survey for Non-CBI Facilities Only

SIC code	Industry description	Waste description	Amount generated in tons	Management practice in 1986
2911	Petroleum refining	Other organic sludge	28	Land treatment
		Oily sludge	3	Land treatment
		Oily sludge	1	Land treatment
		Oily sludge	2,030	Land treatment
		Oily sludge	310	Land treatment
		Oily sludge	281	Land treatment
		Oily sludge	73	Land treatment
		Oil-water emulsion or mixture	142	Land treatment
		Soil contaminated with organics	2,703	Land treatment
		Soil contaminated with organics	204	Land treatment
		Soil contaminated with organics	1	Land treatment
		Other inorganic solids	43	Land treatment
		Spent solid filters or absorbents	80	Land treatment
		Spent solid filters or absorbents	13	Land treatment
		Spent solid filters or absorbents	7	Land treatment
		Metal scale, filings, or scrap	1	Land treatment
		Other inorganic sludge	182	Land treatment
		Other organic sludge	12	Landfill
		Spent carbon	39	Landfill
		Oily sludge	208	Surface impoundment
		Soil contaminated with organics	297	Surface impoundment
		Other inorganic chemicals	1	Surface impoundment
		Spent carbon	12	Waste piles
3011	Miscellaneous plastics products	Soil contaminated with organics	19	Landfill
8221	Colleges, universities, professional schools	Oil-water emulsion or mixture	754	Land treatment
		Other organic liquid	15	Landfill
2800	Chemicals and chemical preparations	Other waste inorganic chemicals	6	Landfill
2821	Plastics materials, synthetic resins, nonvolcanizable elastomers	Spent solid filters or absorbents	3,140	Landfill
2869	Industrial organic chemicals	Other organic liquid	29	Landfill
		Mixed lab packs	15	Landfill
		Other nonhalogenated organic solid	41	Landfill

Table A-1 (continued)

SIC code	Industry description	Waste description	Amount generated in tons	Management practice in 1986
2869	Industrial organic chemicals (cont.)	Solid resins or polymerized organics	172	Landfill
		Solid resins or polymerized organics	1	Landfill
		Metal scale, filings, or scrap	1	Landfill
		Solid resins or polymerized organics	83	Landfill
		Solid resins or polymerized organics	9	Landfill
		Spent solid filters or a desorbent	21	Landfill
		Nonhalogenated solvent	45	Surface impoundment
		Nonhalogenated solvent	28,883	Surface impoundment
		Nonhalogenated solvent	322	Surface impoundment
		Waste oil	383,333	Surface impoundment
		Concentrated aqueous solution of other organics	4,695	Surface impoundment
		Nonhalogenated solvent	4	Surface impoundment
		Soil contaminated with organics	329	Surface impoundment
		Sediment or lagoon dragout contaminated with organics only	303	Surface impoundment
		Sludge with other reactives	31	Surface impoundment
		Acidic aqueous waste	462	Underground injection
2879	Pesticides and agricultural chemicals	Lab packs of old chemicals only	15	Landfill
3317	Coating engraving and allied services	Solid resins or polymerized organics	35	Landfill
2819	Other	Organic paint or ink sludge	19,285	Waste piles
3546	Other fabricated metal products industries, except machinery and transportation equipment industries	Metal scale, filings, or scrap	10	Surface impoundment
3674	Semiconductors and related devices	Concentrated aqueous solution of other organics	45	Surface impoundment
3674	Semiconductors and related devices	Other organic liquid, WOS	1	Surface impoundment
4911	Other electronic, gas, and sanitary services industries	Oil-water emulsion or mixture	42	Surface impoundment
3711	Motor vehicles and passenger car bodies	Empty or crushed metal drums or containers	1	Waste piles
		Solid resins or polymerized organics	3	Waste piles
		Spent solid filters or adsorbents	2	Waste piles
9711	National security	Nonhalogenated solvent	1	Landfill
9711	National security	Other inorganic solids	2	Landfill

Table A-1 (continued)

SIC code	Industry description	Waste description	Amount generated in tons	Management practice in 1986
8999	Commercial Treatment, Storage, Disposal Facility	Empty or crushed metal drums or containers generated by the semiconductors and related devices industry	919	Landfill
		Lab packs of solid old organic chemicals, only	315	Landfill
		Empty or crushed metal drums or containers	57	Landfill
		Solid resins or polymerized organics generated by the manufacturers of paints, varnishes, lacquers, enamels, and allied products	8,687	Landfill
		Other nonhalogenated organic solids	850	Landfill
		Adhesives or expoxies	5	Landfill
		Organic paint or ink sludge	401	Landfill
		Other organic sludge, NOS	433	Landfill
		Resins, tars, or tarry sludge	94	Landfill
		Other organic sludge	48	Landfill
		Still bottoms of nonhalogenated solvents or other organic liquids	26	Landfill
		Halogenated/nonhalogenated solvent mixture	107	Landfill
		Other organic liquid	253	Landfill
		Waste oil	25	Landfill
		Halogenated (e.g., chlorinated) solvent	18	Landfill
		Reactive or polymerizable organic liquid	5	Landfill
		Soil contaminated with organics	810	Landfill
		Ash, slag, or other residue from incineration of wastes	4,598	Landfill
		Other inorganic solids	91	Landfill
		Other inorganic solids, NOS generated by the chemicals and chemical preparations industry,	54 11	Landfill
		Asbestos solids and debris	3	Landfill
		Metal scale, filings, or scrap	1	Landfill
		Other inorganic solids	1	Landfill
		Drilling mud	2	Landfill
		Caustic solution with metals but no cyanides	4	Landfill
		Other inorganic liquid	2	Landfill

Table A-1 (continued)

SIC code	Industry description	Waste description	Amount generated in tons	Management practice in 1986
8999	Commercial Treatment, Storage, Disposal Facility (continued)	Spent acid with metals	1	Landfill
		Spent acid without metals	1	Landfill
		Other inorganic sludge	56	Landfill
		Caustic aqueous waste	1	Landfill
		Aqueous waste with reactive sulfides	1	Landfill
		Aqueous waste with low solvent	1,993	Landfill
		Other organic liquid, NOS	3,449	Surface impoundment
		Equipment cleaning effluent	2	Surface impoundment
		Spent acid with metals	21	Surface impoundment
		Caustic solution with metals but no cyanides	5	Surface impoundment
		Halogenated/nonhalogenated solvent mixture	13,125	Underground injection
		Contact flash point less than 140°F generated by the industrial organic chemicals industry	4,167	Underground injection
		Concentrated solvent-water solution generated by the manufacturers of paints, varnishes, lacquers, enamels, and allied products	4,167	Underground injection
		Other organic liquid	3,340	Underground injection
		Oil-water emulsion or mixture	1,683	Underground injection
		Paint thinner or petroleum distillates	121	Underground injection
		Nonhalogenated solvent	54	Underground injection
		Aqueous waste with other low toxic organics generated by the industrial organic chemicals industry	1,718	Underground injection

Table A-1 (continued)

SIC code	Industry description	Waste description	Amount generated in tons	Management practice in 1986
8999	Commercial Treatment, Storage, Disposal Facility (continued)	Other aqueous wastes with low dissolved solids	402	Underground injection
		Aqueous waste with other low toxic organics	1,424	Underground injection
		Halogenated/nonhalogenated solvent mixture generated by the manufacturers of other miscellaneous plastic products industry	978	Waste piles
		Aqueous solution with low solvents generated from the production of motor vehicle parts and accessories	11,505	Waste piles

Reference: USEPA 1986.

Table A-2 Characterization and Industry Data for Mixed Wastes Containing Ignitable (D001) Wastes According to the 1986 TSDR Survey for Non-CBI, Non-commercial Facilities Only

SIC code	Industry description	Waste code	Waste description	Amount generated in tons	Management practice in 1986
2911	Petroleum refining	D001 D003 D007 D008	Oily sludge	11	Land treatment
		D001 D003	Oily sludge	538	Land treatment
		D001 D007 D008	Soil contaminated with organics	7	Land treatment
		D001 D002	"Dry" line or metal hydroxide solids not "fixed"	4	Land treatment
		D001 D002 D003	Reactive sulfide salts/chemicals	7	Land treatment
		D001 K051	Concentrated aqueous solution of other organic	239	Surface impoundment
		D001 D002 D003	Concentrated aqueous solution of other organic	239	Surface impoundment

Table A-2 (continued)

SIC code	Industry description	Waste code	Waste description	Amount generated in tons	Management practice in 1986
8221	Colleges, universities, professional schools, and junior colleges	D001 D002 D003 U075 U151	Lab packs of old chemicals only	5	Landfill
2800	Chemicals and chemical preparations	D001 D009	Lab packs of old chemicals only	1	Landfill
		D001 D009 D003	Lab packs of debris only	1	Landfill
		D001 D009 D011	Other metal salts/chemicals only	3	Landfill
9711	National security	D001 F003 F005	Nonhalogenated solvent	1	Landfill
		D001 D007	Other waste inorganic chemicals	50	Landfill
1321	Oil and gas extraction	D001 D003	Spent solid filters or absorbents	61	Landfill

Table A-2 (continued)

SIC code	Industry description	Waste code	Waste description	Amount generated in tons	Management practice in 1986
2821	Plastics materials, synthetic resins, and non-volcanizable elastomers	D001	Acidic aqueous waste	1,352	Surface impoundment
		D002	Other reactive chemicals		
		D003			
2833	Medicinal chemicals and botanical products	D001	Concentrated solvent-water solution	2,458,353	Surface impoundment
		D002	Acidic aqueous waste		
		D002	Caustic aqueous waste		
		D003	Caustic solution with cyanides but no metals		
		F002	Aqueous waste with low solvents		
		F003	Aqueous waste with low solvents		
		P106	Caustic solution with cyanides but no metals		
		U080	Halogenated (e.g., chlorinated) solvent		
		U112	Nonhalogenated solvent		
		U154	Nonhalogenated solvent		
		U220	Nonhalogenated solvent		
2869	Industrial organic chemicals	D001	Reactive or polymerizable organic liquid	65,753	Surface impoundment
		D002			
		D003			
		D001	Reactive or polymerizable organic liquid	19	Surface impoundment
		D003			
		D001	Waste oil	30	Surface impoundment
		D002			
		D007			

Table A-2 (continued)

SIC code	Industry description	Waste code	Waste description	Amount generated in tons	Management practice in 1986
2869	Industrial organic chemicals (cont.)	D001	"Dry" line or metal hydroxide solids not "fixed"	2	Surface impoundment
		D002	Batteries or battery parts, casings, cores		
		D001	Aqueous waste with low solvents	40,725	Surface impoundment
		D002	Acidic aqueous waste		
		D003	Aqueous waste with reactive sulfides		
		D007	Other inorganic liquid		
		D001	Aqueous waste with low other toxic organics	7,425	Surface impoundment
		D002	Acidic aqueous waste		
		K011	Aqueous waste with low other toxic organics		
		K013	Aqueous waste with low other toxic organics		
		K014	Aqueous waste with low other toxic organics		
		D001	Reactive or polymerizable organic liquid	899	Surface impoundment
		D002			
		D003			
		F003	Nonhalogenated solvent		
		D001	Nonhalogenated solvent	176	Surface impoundment
		D002			
		D001	Nonhalogenated solvent	37	Surface impoundment
		D002	Reactive or polymerizable organic liquid		
		D003			

Table A-2 (continued)

SIC code	Industry description	Waste code	Waste description	Amount generated in tons	Management practice in 1986
2869	Industrial organic chemicals (cont.)	D001	Aqueous waste with low solvents	383	Surface impoundment
		D002	Acidic aqueous waste		
3662	Mining and quarries of non-metallic minerals, except fuel	D001	Aqueous waste with other reactives (e.g., explosives)	8,382	Surface impoundment
	Other primary metals industries	D007	Other metal salts/chemicals		
	Textile mill products	U188	Concentrated phenolics		
3699	Other electrical and electronic machinery, equipment, and supplies industries	D001	Acidic aqueous waste	507,128	Surface impoundment
		D002	Caustic aqueous waste		
2839	Pharmaceutical preparations	D001	Aqueous waste	54,167	Underground injection
		D007			
		F002			
		F003			
		F005			

Reference: USEPA 1986.

Table A-3 Available Waste Characterizaton Data for D001 Ignitable Liquids Subcategory

Waste constituent	Total concentration (%)	
	Low	High
Volatile Organics		
1,1,1 Trichloroethane	10	25
1,1,2,2 Tetrachloroethane	5	10
1,2 Dichloroethane	5	10
(1,3 Butandiol)	5	10
(2 Pentanol)	5	10
(2 Propanol)	10	20
(2-Ethoxy Ethanol)	5	10
Acetone	11	20
Acetonitrile	20	35
Benzene	3	5
Carbon Disulfide	0	5
Carbon Tetrachloride	5	10
Chloroform	4.25	8.50
Cyclohexane	7.50	15
Ethanol	0.75	14.75
Ether	15	20
Ethyl Ether	0	40
Ethyl Acetate	8.75	15.25
(Ethyl Alcohol)	24.17	32
Ethyl Benzene	0	8
Ethylene Glycol	6	12
Ethylene Vinyl Acetate	5	15
(Heptane)	20	40
(Hexane)	6.25	12.75
Isobutyl Alcohol	0	21
Isopropanol	6	10
Methanol	15	29.40
Methylene Chloride	2.50	14.00
Methyl Ethyl Ketone	18.22	25.63
Methyl Isobutyl Ketone	0	2.82
Methylamine	0	37
(Pentanol)	3	5
Perchloroethylene	5	10
Petroleum Ether	10	20
Styrene	0	95
Toluene	6	15
Trichloroethylene	12.50	17.50
Trichlorotrifluoroethane	2	7
Xylene	17./86	32.61
Volatile organics not specified	28.44	44.79

Note: ( ) denotes a non-BDAT constituent.
Reference: Robertson 1989.

Table A-4 Waste Characterization Data for D001 Oxidizer Subcategory

Type of waste	Constituents	General or typical concentration or amount	Comments
Propellants, exploding and pyrotechnics	Potassium Nitrate	Trace	D001
	Barium Peroxide	Trace	D001, D005,
	Strontium Nitrate	Trace	D001
	Potassium Chlorate	Trace	D001
Waste Propellant	Barium Nitrate	Trace	D001, D005,
	Potassium Nitrate	Trace	D001

Reference: Department of the Army 1987.

APPENDIX B

WASTE CHARACTERIZATION AND INDUSTRIAL DESCRIPTIONS FOR D002 WASTES

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids	Acidic aqueous waste	Abrasive products	110 G	DK	DK	DK	2
	Acidic aqueous waste	Agricultural chemicals, nec	9 T	N/A	83	N/A	2
	Acidic aqueous waste	Agricultural chemicals, nec	9620 T	1	99	DK	2
	Acidic aqueous waste	Agricultural chemicals, nec	835 T	0	90	0	2
	Acidic aqueous waste	Agricultural chemicals, nec, Organic pesticide products	22 T	1	99	DK	2
	Acidic aqueous waste	Aircraft	322 G	0	DK	0	2
	Acidic aqueous waste	Aircraft engines and engine parts	48 G	2	DK	DK	2
	Acidic aqueous waste	Aircraft engines and engine parts	6048 G	DK	DK	DK	2
	Acidic aqueous waste	Aircraft engines and engine parts	4848 G	DK	DK	DK	2
	Acidic aqueous waste	Aircraft equipment, nec	600 G	1	DK	DK	2
	Acidic aqueous waste	Aircraft equipment, nec	275 G	73	DK	DK	2
	Acidic aqueous waste	Aircraft equipment, nec	1000 G	5	75	DK	2.6
	Acidic aqueous waste	Aircraft equipment, nec	1430 G	2	DK	DK	4
	Acidic aqueous waste	Aircraft equipment, nec	1000 G	5	75	DK	5
	Acidic aqueous waste	Alkalies and chlorine	86068 G	1	95	N/A	2
	Acidic aqueous waste	Alkalies and chlorine	2628000 G	DK	DK	DK	2
	Acidic aqueous waste	Animal specialties, nec	160 G	0	98	present	2
	Acidic aqueous waste	Blast furnaces and steel mills	DK	N/A	DK	DK	2
	Acidic aqueous waste	Blast furnaces and steel mills	700000 T	6	98	DK	2
	Acidic aqueous waste	Bolts, nuts, rivets, and washers	130000 G	2	93	1	5
	Acidic aqueous waste	Building maintenance services, nec	1 T	95	DK	DK	2.6
	Acidic aqueous waste	Chemical preparations, nec	28000 T	DK	99	DK	2
	Acidic aqueous waste	Chemical preparations, nec	6074 T	DK	DK	DK	2
	Acidic aqueous waste	Chemicals and allied products	12000 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products	15000 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products	6 T	1	60	0	2
	Acidic aqueous waste	Chemicals and allied products, Industrial inorganic chemicals, nec,Industrial organic chemicals, nec	15575 G	DK	DK	0	6
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	3400 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	10000 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	8400 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	78000 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	20800 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	1200 G	DK	99	DK	2
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	0	DK	99	N/A	7
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	18000 G	DK	99	DK	7
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	8000 G	DK	99	0	7
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	700 G	DK	99	DK	7
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	40782 G	DK	99	DK	7
	Acidic aqueous waste	Chemicals and allied products, Petroleum products, nec	10200 G	DK	99	DK	7
	Acidic aqueous waste	Cold finishing of steel shapes	4000000 G	1	99	DK	2.3
	Acidic aqueous waste	Colleges and universities, nec	2 T	3	10	0	2
	Acidic aqueous waste	Commercial testing laboratories	15 T	DK	DK	DK	3
	Acidic aqueous waste	Copper rolling and drawing	375000 T	1	99	0	2
	Acidic aqueous waste	Copper rolling and drawing, Brass, bronze, and copper foundries, Nonferrous forgings	337100 T	DK	99	DK	3
	Acidic aqueous waste	Copper rolling and drawing, Motor vehicle parts and accessories	124327 T	DK	DK	N/A	2
	Acidic aqueous waste	Costume jewelry, General chemical manufacturing, Chemical preparations, nec	11 T	0	80	DK	2
	Acidic aqueous waste	Costume jewelry, General chemical manufacturing, Chemical preparations, nec	1 T	0	DK	N/A	2
	Acidic aqueous waste	Costume jewelry, General chemical manufacturing, Chemical preparations, nec	18 T	0	56	DK	12
	Acidic aqueous waste	Current-carrying wiring devices,Electron tubes, transmitting,Electronic components, nec	2250 G	1	97	1	3
	Acidic aqueous waste	Current-carrying wiring devices,Electron tubes, transmitting,Electronic components, nec	2700 G	1	97	1	3
	Acidic aqueous waste	Cyclic crudes and intermediates	48430 T	0	98	0	2
	Acidic aqueous waste	Cyclic crudes and intermediates	6915 T	0	84	16	2
	Acidic aqueous waste	Cyclic crudes and intermediates	13000 T	0	99	0	2
	Acidic aqueous waste	Cyclic crudes and intermediates, Nitrogenous fertilizers	14900 T	DK	99	DK	2
	Acidic aqueous waste	Cyclic crudes and intermediates, Surface active agents	0	DK	90	1	4
	Acidic aqueous waste	DK	46800 G	0	99	0	2
	Acidic aqueous waste	DK	6000000 G	DK	99	DK	2
	Acidic aqueous waste	DK	63072000 G	0	99	not present	2
	Acidic aqueous waste	DK	41527 T	present	94	DK	2
	Acidic aqueous waste	DK	67600 G	DK	98	DK	7
	Acidic aqueous waste	DK	131600 G	DK	99	DK	7
	Acidic aqueous waste	Electric and other services combined	50 G	0	95	DK	2

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids (continued)	Acidic aqueous waste	Electric and other services combined, Electric services	4125 T	1	98	1	2
	Acidic aqueous waste	Electric services	1534068 G	DK	DK	DK	2
	Acidic aqueous waste	Electric services	41000 G	present	99	N/A	2
	Acidic aqueous waste	Electric services	48542 T	N/A	99	N/A	2
	Acidic aqueous waste	Electric services	DK	1	present	DK	2
	Acidic aqueous waste	Electric services	172621 T	1	99	0	2
	Acidic aqueous waste	Electric services	238032 T	1	99	0	2
	Acidic aqueous waste	Electric services	1447 T	N/A	95	N/A	2
	Acidic aqueous waste	Electric services	9293 T	N/A	95	N/A	2
	Acidic aqueous waste	Electric services	809 T	N/A	95	N/A	2
	Acidic aqueous waste	Electric services	5320300 G	N/A	present	N/A	2
	Acidic aqueous waste	Electric services	818000 G	N/A	present	N/A	2
	Acidic aqueous waste	Electric services	943000 G	N/A	present	N/A	2
	Acidic aqueous waste	Electric services	273100 G	N/A	present	N/A	2
	Acidic aqueous waste	Electric services	3711900 G	N/A	present	N/A	2
	Acidic aqueous waste	Electric services	262800 G	N/A	present	N/A	2
	Acidic aqueous waste	Electric services	216 G	present	DK	N/A	2
	Acidic aqueous waste	Electric services	1548600 G	N/A	present	N/A	2
	Acidic aqueous waste	Electric services	413335 G	DK	99	DK	7
	Acidic aqueous waste	Electric services	6887400 G	DK	DK	DK	7
	Acidic aqueous waste	Electric services	3753634 G	DK	DK	DK	7
	Acidic aqueous waste	Electric services	189200 G	DK	DK	DK	7
	Acidic aqueous waste	Electric services	130720 G	DK	DK	DK	7
	Acidic aqueous waste	Electric services	9233 T	DK	99	DK	7.25
	Acidic aqueous waste	Electron tubes, transmitting	1201368 G	present	99	DK	5
	Acidic aqueous waste	Electronic capacitors	5 T	DK	30	1	2
	Acidic aqueous waste	Electronic components, nec	259 G	DK	DK	DK	2
	Acidic aqueous waste	Electronic components, nec	336 G	DK	DK	DK	2
	Acidic aqueous waste	Electronic components, nec	300 G	1	93	DK	2
	Acidic aqueous waste	Electronic components, nec	50 G	1	DK	DK	2
	Acidic aqueous waste	Electronic components, nec	3 T	DK	DK	DK	5
	Acidic aqueous waste	Electronic components, nec	16797000 G	present	95	present	7
	Acidic aqueous waste	Electronic components, nec	1500 G	0	99	0	8
	Acidic aqueous waste	Electronic computing equipment	1260 G	1	90	DK	2
	Acidic aqueous waste	Electronic computing equipment,Electronic components, nec	1 T	7	90	0	2
	Acidic aqueous waste	Electronic computing equipment,Electronic components, nec	1 T	1	50	0	2
	Acidic aqueous waste	Electronic computing equipment,Electronic components, nec	1 T	1	30	0	2
	Acidic aqueous waste	Electronic computing equipment,Electronic components, nec	2127 T	0	99	DK	2
	Acidic aqueous waste	Engine electrical equipment	39 T	DK	DK	DK	2
	Acidic aqueous waste	Engine electrical equipment	2400 G	0	98	0	5
	Acidic aqueous waste	Engineering and scientific instruments, Environmental controls, Process control instruments	32620 G	present	80	0	2
	Acidic aqueous waste	Engineering and scientific instruments, Surgical and medical instruments	175 G	present	99	DK	2
	Acidic aqueous waste	Engraving and plate printing	1870 G	present	20	DK	2
	Acidic aqueous waste	Fabricated metal products, nec, Plating and polishing	2703279 G	DK	95	N/A	2
	Acidic aqueous waste	General chemical manufacturing	350 T	0.5	98	0.2	2
	Acidic aqueous waste	General chemical manufacturing	300000 G	0	99	DK	7
	Acidic aqueous waste	General chemical manufacturing, Industrial organic chemicals, nec,Petroleum refining	703 T	DK	90	DK	6
	Acidic aqueous waste	General crop services	2854 T	1	99	DK	2
	Acidic aqueous waste	General crop services	4 G	DK	present	N/A	2
	Acidic aqueous waste	Glass containers	211237 G	22	78	N/A	2.3
	Acidic aqueous waste	Guided missiles and space vehicles, Space propulsion units and parts	2 T	DK	90	N/A	2
	Acidic aqueous waste	Guided missiles and space vehicles, Space propulsion units and parts	1 T	5	89	N/A	6
	Acidic aqueous waste	Hand and edge tools, nec	1 T	N/A	N/A	N/A	2
	Acidic aqueous waste	Household cooking equipment,Household appliances, nec	10800000 G	N/A	98	0	2
	Acidic aqueous waste	Industrial gases	44676000 G	10	99	1	3
	Acidic aqueous waste	Industrial inorganic and organic chemicals, nec, Nitrogenous fertilizers	DK	present	present	N/A	2
	Acidic aqueous waste	Industrial inorganic and organic chemicals, nec, Nitrogenous fertilizers	DK	present	present	N/A	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	4400000 T	present	present	N/A	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	78118501 G	1	99	0	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	1005 G	1	97	N/A	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	41300 G	0	99	0	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	49000 G	0	99	0	2

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids (continued)	Acidic aqueous waste	Industrial inorganic chemicals, nec	5651 T	0.1	99	DK	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	3471 T	0	99	0	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	525000 G	2	99	1	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	5 G	1	98	DK	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	365000 T	1	95	0	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	3150000 G	present	98	0	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	365000000 G	DK	100	DK	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	935194 T	DK	95	0.1	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec	148986 T	present	99	N/A	3
	Acidic aqueous waste	Industrial inorganic chemicals, nec	1217640 T	0	99	0	7
	Acidic aqueous waste	Industrial inorganic chemicals, nec	250000 G	N/A	99	N/A	7
	Acidic aqueous waste	Industrial inorganic chemicals, nec, Aircraft engines and engine parts	156 T	DK	95	0	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec, Nitrogenous fertilizers	2628000 G	0	99	not present	2
	Acidic aqueous waste	Industrial inorganic chemicals, nec, Nitrogenous fertilizers	1576800 G	0	99	not present	2
	Acidic aqueous waste	Industrial organic chemicals, nec	119827 G	DK	99	DK	2
	Acidic aqueous waste	Industrial organic chemicals, nec	1817 T	0	87	0.1	2
	Acidic aqueous waste	Industrial organic chemicals, nec	2 T	present	present	present	2
	Acidic aqueous waste	Industrial organic chemicals, nec	126 T	present	present	present	2
	Acidic aqueous waste	Industrial organic chemicals, nec	DK	present	present	present	2
	Acidic aqueous waste	Industrial organic chemicals, nec	119 T	DK	90	DK	2
	Acidic aqueous waste	Industrial organic chemicals, nec	5100 G	5	80	N/A	2
	Acidic aqueous waste	Industrial organic chemicals, nec	2376150 G	0	99	0	2
	Acidic aqueous waste	Industrial organic chemicals, nec	469257 T	DK	95	0.8	2
	Acidic aqueous waste	Industrial organic chemicals, nec	280 G	DK	DK	0	2
	Acidic aqueous waste	Industrial organic chemicals, nec	1 T	DK	DK	DK	2
	Acidic aqueous waste	Industrial organic chemicals, nec	277776 T	DK	99	present	2
	Acidic aqueous waste	Industrial organic chemicals, nec	342 T	5	40	10	3
	Acidic aqueous waste	Industrial organic chemicals, nec	36 T	DK	70	DK	4
	Acidic aqueous waste	Industrial organic chemicals, nec	182382 T	1	99	1	4
	Acidic aqueous waste	Industrial organic chemicals, nec	404623 G	2	70	8	5
	Acidic aqueous waste	Industrial organic chemicals, nec	DK	present	present	0	6
	Acidic aqueous waste	Industrial organic chemicals, nec	6 T	2	98	0	7.5
	Acidic aqueous waste	Industrial organic chemicals, nec	209 T	present	98	present	7.5
	Acidic aqueous waste	Industrial organic chemicals, nec, Chemical preparations, nec	17302 T	DK	DK	DK	7.25
	Acidic aqueous waste	Industrial organic chemicals, nec, Industrial inorganic chemicals, nec	64317 T	DK	99	present	2
	Acidic aqueous waste	Industrial organic chemicals, nec,Industrial inorganic chemicals,nec, Nitrogenous fertilizers	26280000 G	0	99	not present	2
	Acidic aqueous waste	Industrial organic chemicals, nec,Plastics materials and resins	218900 T	present	99	present	2
	Acidic aqueous waste	Industrial organic chemicals, nec,Plastics materials and resins	76700 T	DK	98	present	9
	Acidic aqueous waste	Manufacturing industries, nec	1 G	1	40	6	4
	Acidic aqueous waste	Measuring and controlling devices, nec	557400 G	DK	present	DK	6
	Acidic aqueous waste	Metal coating and allied services	3852000 G	0.06	99	0	2
	Acidic aqueous waste	Metal coating and allied services	4500 T	2	98	0	10
	Acidic aqueous waste	Metal coating and allied services, Fabricated structural metal, Architectural metal work	747000 G	1	99	DK	2
	Acidic aqueous waste	Metal office furniture	2400 G	0	95	2	4
	Acidic aqueous waste	Metal stampings, nec	750000 G	1	99	1	2
	Acidic aqueous waste	miscellaneous fabricated wire products	13537 T	DK	90	DK	2
	Acidic aqueous waste	miscellaneous fabricated wire products	8144750 G	1	99	0	7
	Acidic aqueous waste	Miscellaneous plastics products	365422880 G	present	present	present	2
	Acidic aqueous waste	Miscellaneous plastics products	370 G	Dk	DK	DK	2
	Acidic aqueous waste	Miscellaneous plastics products	0 G	5	95	DK	4
	Acidic aqueous waste	Motor vehicle parts and accessories	2 T	98	2	DK	2
	Acidic aqueous waste	Motorcycles, bicycles, and parts	2000 G	N/A	96	N/A	5
	Acidic aqueous waste	National security	DK	DK	present	DK	2
	Acidic aqueous waste	National security	1 T	DK	DK	DK	2
	Acidic aqueous waste	National security	1 T	DK	DK	DK	2
	Acidic aqueous waste	National security	14700000 G	present	99	present	2
	Acidic aqueous waste	National security	19 G	0	43	0	2
	Acidic aqueous waste	National security	1 G	0	75	0	2
	Acidic aqueous waste	National security	2 G	0	4	0	2
	Acidic aqueous waste	National security	20 G	0	50	0	2
	Acidic aqueous waste	National security	1 T	0	50	DK	4
	Acidic aqueous waste	National security	700000 G	1	99	0	8

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids (continued)	Acidic aqueous waste	National security, Ammunition, except for small arms, nec	1100 G	0	60	N/A	2
	Acidic aqueous waste	Nitrogenous fertilizers	6580000 G	0	99	0	2
	Acidic aqueous waste	Nitrogenous fertilizers	70985200 G	2	98	DK	2
	Acidic aqueous waste	Nonferrous rolling and drawing, nec, Fabricated metal products, nec, Miscellaneous metal work	220 T	8	90	1	2
	Acidic aqueous waste	Nonferrous wire drawing and insulating	1578 G	5	98	N/A	2
	Acidic aqueous waste	Nonferrous wire drawing and insulating	29250 G	2	80	present	2
	Acidic aqueous waste	Nonmetallic mineral products, nec	1693440 G	2	98	DK	2
	Acidic aqueous waste	Nonwoven fabrics, Research and development laboratories	1 T	DK	DK	DK	2
	Acidic aqueous waste	Oil and gas field services, nec	180000 G	DK	DK	DK	7
	Acidic aqueous waste	Oil and gas field services, nec	72000 G	DK	DK	DK	7
	Acidic aqueous waste	Ordinance and accessories, nec	110 G	DK	90	N/A	2
	Acidic aqueous waste	Organic pesticide products	1387 T	5	98	0	2
	Acidic aqueous waste	Petroleum refining	8 T	25	75	DK	2
	Acidic aqueous waste	Petroleum refining	166327 G	DK	present	DK	5
	Acidic aqueous waste	Petroleum refining	468000 G	DK	present	DK	12
	Acidic aqueous waste	Phosphatic fertilizers	500 G	2	90	N/A	2
	Acidic aqueous waste	Photofinishing laboratories	12 G	10	90	0	2
	Acidic aqueous waste	Photofinishing laboratories, Signs and advertising displays,Photoengraving	55 G	DK	DK	DK	5
	Acidic aqueous waste	Photographic equipment and supplies	40 G	DK	DK	DK	2
	Acidic aqueous waste	Photographic equipment and supplies	1 T	N/A	80	0	2
	Acidic aqueous waste	Photographic equipment and supplies	1 T	N/A	60	30	2
	Acidic aqueous waste	Plastics materials and resins	10041 T	0	90	DK	2
	Acidic aqueous waste	Plating and polishing	DK	N/A	97	N/A	2
	Acidic aqueous waste	Plating and polishing	4900 G	15	90	N/A	2
	Acidic aqueous waste	Plating and polishing	495 G	DK	DK	DK	2
	Acidic aqueous waste	Plating and polishing	750 G	5	85	0	2
	Acidic aqueous waste	Plating and polishing	3500 G	2	87	0	2
	Acidic aqueous waste	Plating and polishing	150 G	5	98	0	2
	Acidic aqueous waste	Plating and polishing	2250000 G	N/A	99	DK	2
	Acidic aqueous waste	Plating and polishing	1123 T	0	99	DK	2
	Acidic aqueous waste	Plating and polishing	43875000 G	DK	99	DK	7
	Acidic aqueous waste	Plating and polishing, Current-carrying wiring devices, Electronic connectors	54000 T	1	99	DK	2
	Acidic aqueous waste	Plating and polishing,Metal coating and allied services	113333 G	DK	60	DK	2
	Acidic aqueous waste	Plating and polishing,Metal coating and allied services,Steel wire and related products	177270 T	present	93	N/A	2
	Acidic aqueous waste	Primary batteries, dry and wet	5 T	DK	DK	DK	2
	Acidic aqueous waste	Products of purchased glass	324 T	0	99	0	2
	Acidic aqueous waste	Radio and TV communication equipment	231 G	11	87	N/A	4
	Acidic aqueous waste	Radio and TV communication equipment,Electronic components, nec,Plating and polishing	490 T	18	N/A	N/A	2
	Acidic aqueous waste	Refrigeration and heating equipment, Motor vehicle parts and accessories,Aircraft equipment, nec	37200 G	1	99	DK	2
	Acidic aqueous waste	Refuse systems	450 G	N/A	40	N/A	4
	Acidic aqueous waste	Research and development laboratories	22 T	15	85	DK	2
	Acidic aqueous waste	Research and development laboratories	165 G	1	89	DK	2
	Acidic aqueous waste	Research and development laboratories	4426 G	DK	present	DK	3
	Acidic aqueous waste	Research and development laboratories	156 G	37	55	35	4
	Acidic aqueous waste	Secondary nonferrous metals, Aluminum rolling and drawing, nec, Nonferrous rolling and drawing, nec	17815 G	DK	98	DK	2
	Acidic aqueous waste	Semiconductors and related devices	5000000	1	99	1	2
	Acidic aqueous waste	Semiconductors and related devices	173600 G	0	90	0	2
	Acidic aqueous waste	Semiconductors and related devices	72650 G	0	70	0	2
	Acidic aqueous waste	Semiconductors and related devices	44500 G	0	10	0	2
	Acidic aqueous waste	Semiconductors and related devices	275 G	0	75	present	2
	Acidic aqueous waste	Semiconductors and related devices	250 G	0	80	0	2
	Acidic aqueous waste	Semiconductors and related devices	33900 G	14	79	0	2
	Acidic aqueous waste	Semiconductors and related devices	15310 G	present	99	N/A	2
	Acidic aqueous waste	Semiconductors and related devices	5 T	0	73	0	2
	Acidic aqueous waste	Semiconductors and related devices	44399027 G	present	99	present	2
	Acidic aqueous waste	Semiconductors and related devices	263500 T	1	98	1	3
	Acidic aqueous waste	Semiconductors and related devices	4 T	0	50	DK	3
	Acidic aqueous waste	Semiconductors and related devices	3444 T	3	94	0	4
	Acidic aqueous waste	Semiconductors and related devices	1 T	0	60	DK	4
	Acidic aqueous waste	Semiconductors and related devices	8 G	0	20	DK	4
	Acidic aqueous waste	Semiconductors and related devices	6837 T	1	99	present	6
	Acidic aqueous waste	Semiconductors and related devices	67510000 G	DK	DK	1	6.9

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids (continued)	Acidic aqueous waste	Semiconductors and related devices	150000 T	1	99	0	7
	Acidic aqueous waste	Semiconductors and related devices	208 G	1	99	0	8
	Acidic aqueous waste	Soap and other detergents	1750 G	0	50	DK	12
	Acidic aqueous waste	Softwood veneer and plywood	3659520 G	0	99	0	2
	Acidic aqueous waste	Space propulsion units and parts	800000 G	0	100	0	2
	Acidic aqueous waste	Space research and technology	300 G	2	50	DK	2
	Acidic aqueous waste	Space research and technology	1 G	5	50	DK	2
	Acidic aqueous waste	Steel pipe and tubes	5000000 G	5	95	0	2
	Acidic aqueous waste	Steel wire and related products	25000 G	N/A	present	present	2
	Acidic aqueous waste	Storage batteries	70000 G	2	98	DK	3
	Acidic aqueous waste	Storage batteries, Primary batteries, dry and wet	116 T	0	DK	N/A	2
	Acidic aqueous waste	Surgical appliances and supplies	1318500 G	1	97	DK	7
	Acidic aqueous waste	Synthetic rubber	1200 T	0	99	0	2
	Acidic aqueous waste	Telephone and telegraph apparatus, Semiconductors and related devices,Radio and TV communication eq	480 G	15	85	0	4
	Acidic aqueous waste	Telephone and telegraph apparatus,Semiconductors and related devices	17000 G	1	DK	DK	2
	Acidic aqueous waste	Telephone and telegraph apparatus,Semiconductors and related devices	17000 G	1	DK	DK	2
	Acidic aqueous waste	Telephone and telegraph apparatus,Semiconductors and related devices	17000 G	1	DK	DK	2
	Acidic aqueous waste	Water supply	832058 T	0.1	95	0	12
Aqueous inorganic liquids	Aqueous waste with low other toxic organics	Agricultural chemicals, nec	4095000 G	13	87	1	12
	Aqueous waste with low other toxic organics	Electrical equipment and supplies, nec	330 G	9	91	0	6
	Aqueous waste with low other toxic organics	Special warehousing and storage, nec	217000 G	15	85	2	3
Aqueous inorganic liquids	Aqueous waste with low solvents	Cyclic crudes and intermediates	270000 G	10	85	5	4
	Aqueous waste with low solvents	Electrical equipment and supplies, nec	220 G	15	80	DK	11
	Aqueous waste with low solvents	General chemical manufacturing	1861 G	present	present	present	12
	Aqueous waste with low solvents	Pharmaceutical preparations	61 T	0	90	DK	7
	Aqueous waste with low solvents	Semiconductors and related devices	880 G	0	30	present	2
Aqueous inorganic liquids	Caustic Aqueous waste	Agricultural chemicals, nec	3 T	1	91	3	10
	Caustic Aqueous waste	Agricultural chemicals, nec	435 T	1	0	N/A	10
	Caustic Aqueous waste	Agricultural chemicals, nec, Organic pesticide products	21 T	2	98	1	12
	Caustic Aqueous waste	Air, water, and solid waste management	100 G	0	90	0	12
	Caustic Aqueous waste	Aircraft engines and engine parts	220 G	DK	DK	DK	12
	Caustic Aqueous waste	Aircraft engines and engine parts	216 G	12	DK	DK	12
	Caustic Aqueous waste	Aircraft engines and engine parts	5832 G	DK	DK	DK	12
	Caustic Aqueous waste	Aircraft engines and engine parts	2280 G	DK	DK	DK	12
	Caustic Aqueous waste	Aircraft engines and engine parts	168 G	DK	DK	DK	12
	Caustic Aqueous waste	Aircraft engines and engine parts	1824 G	DK	DK	DK	12
	Caustic Aqueous waste	Aircraft engines and engine parts	12 G	DK	DK	DK	12
	Caustic Aqueous waste	Aircraft engines and engine parts	168 G	DK	DK	DK	12
	Caustic Aqueous waste	Aluminum sheet, plate, and foil, Aluminum rolling and drawing, nec	46000 T	1	99	DK	7
	Caustic Aqueous waste	Blast furnaces and steel mills	8 T	DK	DK	N/A	11
	Caustic Aqueous waste	Blast furnaces and steel mills	58 T	12	88	N/A	12
	Caustic Aqueous waste	Bolts, nuts, rivets, and washers	3640000 G	2	93	1	10
	Caustic Aqueous waste	Chemical preparations, nec	200 G	25	75	1	2
	Caustic Aqueous waste	Commercial laundry	13 T	40	60	0	2
	Caustic Aqueous waste	Costume jewelry	330 G	20	10	DK	12
	Caustic Aqueous waste	Costume jewelry	55 G	15	30	DK	12
	Caustic Aqueous waste	Cyclic crudes and intermediates	165000000 G	N/A	99	N/A	2
	Caustic Aqueous waste	DK	180 G	present	5	DK	11
	Caustic Aqueous waste	DK	DK	DK	DK	DK	12
	Caustic Aqueous waste	DK	5 G	0	50	0	12
	Caustic Aqueous waste	DK	16795 T	present	98	DK	12
	Caustic Aqueous waste	Electric services	3423000 G	DK	99	DK	2
	Caustic Aqueous waste	Electric services	4693 T	N/A	99	N/A	2
	Caustic Aqueous waste	Electric services	35997 T	DK	99	0	7.25
	Caustic Aqueous waste	Electric services	992715 G	present	99	DK	7.25
	Caustic Aqueous waste	Electric services	9862 T	0	99	N/A	7.25
	Caustic Aqueous waste	Electric services	1641 T	DK	99	N/A	7.25
	Caustic Aqueous waste	Electric services	1591 T	1	99	0	7.5
	Caustic Aqueous waste	Electric services	23852 T	DK	99	DK	7.5

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids (continued)	Caustic Aqueous waste	Electric services	55 G	1	99	DK	10
	Caustic Aqueous waste	Electric services	1000000 G	1	99	1	12
	Caustic Aqueous waste	Electronic components, nec	48 G	0	50	0	12
	Caustic Aqueous waste	Electronic components, nec	218000 G	2	98	0	12
	Caustic Aqueous waste	Electronic computing equipment	95938 G	5	80	DK	8
	Caustic Aqueous waste	Electronic computing equipment	13 T	10	90	N/A	12
	Caustic Aqueous waste	Fabricated metal products, nec	270000 G	1	98	0	7
	Caustic Aqueous waste	Fabricated metal products, nec	DK	DK	DK	DK	12
	Caustic Aqueous waste	Fabricated metal products, nec, Screw machine products	400 G	5	90	N/A	12
	Caustic Aqueous waste	Fluid meters and counting devices	140 G	present	50	DK	11
	Caustic Aqueous waste	General chemical manufacturing	32 T	11	89	N/A	12
	Caustic Aqueous waste	General crop services	88395 T	2	99	0.1	12
	Caustic Aqueous waste	Heating equipment, except electric, Fabricated metal products, nec	1595 G	present	95	N/A	11
	Caustic Aqueous waste	Household refrigerators and freezers	1 T	DK	25	DK	3
	Caustic Aqueous waste	Industrial controls	18 T	5	95	DK	12
	Caustic Aqueous waste	Industrial gases	1 T	0	80	0	7
	Caustic Aqueous waste	Industrial organic chemicals, nec	210000 G	0	99	0	10
	Caustic Aqueous waste	Industrial organic chemicals, nec	680000 G	0	99	0	10
	Caustic Aqueous waste	Industrial organic chemicals, nec	168000 G	0	99	0	11
	Caustic Aqueous waste	Industrial organic chemicals, nec	0	DK	75	N/A	12
	Caustic Aqueous waste	Industrial organic chemicals, nec	2326 T	present	present	0	12.5
	Caustic Aqueous waste	Industrial organic chemicals, nec,Agricultural chemicals, nec, Cyclic crudes and intermediates	4350000 G	1	98	1	10
	Caustic Aqueous waste	Industrial organic chemicals, nec,Agricultural chemicals, nec, Plastics materials and resins	4 T	present	present	present	2
	Caustic Aqueous waste	Industrial organic chemicals, nec,Agricultural chemicals, nec, Plastics materials and resins	6 T	present	present	present	2
	Caustic Aqueous waste	Industrial organic chemicals, nec,Plastics materials and resins	4 T	present	present	present	2
	Caustic Aqueous waste	Instruments to measure electricity, Process control instruments	2805 G	present	99	DK	11
	Caustic Aqueous waste	Lubricating oils and greases	15000 G	DK	95	DK	12
	Caustic Aqueous waste	Machine tools, metal cutting types,Special dies, tools,jigs, and fixture,Machine tool accessories	55 G	1	97	DK	12
	Caustic Aqueous waste	Metal coating and allied services	338700 G	1	99	0	8
	Caustic Aqueous waste	Metal coating and allied services	202100 G	1	99	0	8
	Caustic Aqueous waste	Metal coating and allied services	646752 T	present	99	DK	8
	Caustic Aqueous waste	Metal coating and allied services	DK	31	DK	DK	12
	Caustic Aqueous waste	Metal coating and allied services, Coating, engraving, and allied services	7150 G	DK	98	DK	10
	Caustic Aqueous waste	Metal coating and allied services, Coating, engraving, and allied services	660 G	DK	75	DK	11
	Caustic Aqueous waste	Metal coating and allied services, Coating, engraving, and allied services	513 G	DK	90	DK	11
	Caustic Aqueous waste	Metal office furniture, Metal partitions and fixtures, Furniture and fixtures, nec	550 G	present	present	present	12
	Caustic Aqueous waste	Metal stampings, nec, Sheet metal work, Metal barrels, drums, and pails	0	0	96	1	12
	Caustic Aqueous waste	Metal working machinery, nec	250 G	1	98	N/A	2
	Caustic Aqueous waste	Metal working machinery, nec	300 G	DK	DK	DK	2
	Caustic Aqueous waste	miscellaneous fabricated wire products	6508 T	DK	90	DK	12
	Caustic Aqueous waste	Miscellaneous metal work	20000 G	5	90	DK	5
	Caustic Aqueous waste	Motor vehicle parts and accessories	DK	N/A	30	DK	12
	Caustic Aqueous waste	Motor vehicles and car bodies	23200 G	DK	DK	DK	12
	Caustic Aqueous waste	Motors and generators	30 G	DK	DK	DK	12
	Caustic Aqueous waste	Motors and generators, Motor vehicle parts and accessories	2 T	10	80	N/A	12
	Caustic Aqueous waste	National security	7 T	0	90	N/A	11
	Caustic Aqueous waste	National security	0	DK	DK	DK	12
	Caustic Aqueous waste	National security	1 T	0	75	DK	12
	Caustic Aqueous waste	National security	1 T	0	75	DK	12
	Caustic Aqueous waste	National security	2 T	0	90	N/A	12
	Caustic Aqueous waste	National security	415214 G	5	95	1	12
	Caustic Aqueous waste	National security	2640 G	1	99	0	12.5
	Caustic Aqueous waste	Noncommercial research organizations	1 T	15	75	N/A	2.2
	Caustic Aqueous waste	Organic pesticide products	120000 G	DK	95	DK	12
	Caustic Aqueous waste	Organic pesticide products	100000 G	0.5	80	N/A	12
	Caustic Aqueous waste	Petroleum refining	173 T	0	99	0	12
	Caustic Aqueous waste	Petroleum refining	33 T	0	99	N/A	12
	Caustic Aqueous waste	Petroleum refining	10000 G	5	95	DK	12
	Caustic Aqueous waste	Photographic equipment and supplies	1610 G	0	90	N/A	12
	Caustic Aqueous waste	Plastics materials and resins, Adhesives and sealants	40 T	30	70	30	10
	Caustic Aqueous waste	Plating and polishing	4 T	3	95	0	12
	Caustic Aqueous waste	Plating and polishing	4908 G	14	86	7	12

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids (continued)	Caustic Aqueous waste	Primary batteries, dry and wet	150 G	present	99	DK	10
	Caustic Aqueous waste	Primary batteries, dry and wet	2 T	DK	DK	DK	11
	Caustic Aqueous waste	Primary batteries, dry and wet, Storage batteries	11000 G	45	55	DK	12
	Caustic Aqueous waste	Radio and TV communication equipment, Aircraft equipment, nec	40 T	15	80	3	12
	Caustic Aqueous waste	Repair services, nec	2500 G	2	97	DK	10
	Caustic Aqueous waste	Repair services, nec, Paints and allied products	1250000 G	20	80	DK	11
	Caustic Aqueous waste	Research and development laboratories	110 G	DK	present	DK	9
	Caustic Aqueous waste	Research and development laboratories	9370 G	5	75	N/A	10
	Caustic Aqueous waste	Research and development laboratories	201 T	15	85	DK	12
	Caustic Aqueous waste	Semiconductors and related devices	315 G	1	70	1	12
	Caustic Aqueous waste	Semiconductors and related devices	22410 G	0	90	present	12
	Caustic Aqueous waste	Ship building and repairing	11904 G	DK	99	DK	9.8
	Caustic Aqueous waste	Ship building and repairing	239000 G	0	90	0	12
	Caustic Aqueous waste	Space research and technology	1500 G	10	50	DK	12
	Caustic Aqueous waste	Space research and technology, Photofinishing laboratories	2750 G	present	present	DK	12
	Caustic Aqueous waste	Switching and terminal devices	275000 G	DK	DK	DK	11
	Caustic Aqueous waste	Tanks and tank components	20 T	5	95	2	12
	Caustic Aqueous waste	Telephone and telegraph apparatus,Semiconductors and related devices	660 G	1	98	DK	12
	Caustic Aqueous waste	Trucking, except local	936000 G	DK	DK	DK	12
	Caustic Aqueous waste	Valves and pipe fittings	2700 G	DK	95	DK	12
	Caustic Aqueous waste	DK	1850 G	99	1	10	2
Aqueous inorganic liquids	Other aqueous waste with low dissolved solids	Cyclic crudes and intermediates	315000 G	0	99	0	2
	Other aqueous waste with low dissolved solids	Cyclic crudes and intermediates	1044400 G	1	99	1	7
	Other aqueous waste with low dissolved solids	DK	34 T	5	95	1	2
	Other aqueous waste with low dissolved solids	Electrical equipment and supplies, nec	54773 T	0	99	0	10
	Other aqueous waste with low dissolved solids	Fabricated metal products, nec	935 G	DK	95	DK	6
	Other aqueous waste with low dissolved solids	Fabricated rubber products, nec	99162 T	40	60	N/A	8
	Other aqueous waste with low dissolved solids	Guided missiles and space vehicles, Aircraft, Aircraft equipment, nec	143 T	N/A	98	0	7
	Other aqueous waste with low dissolved solids	Industrial inorganic chemicals, nec	167428 T	1	99	1	7
	Other aqueous waste with low dissolved solids	Nitrogenous fertilizers	9681245 G	1	99	DK	7.4
	Other aqueous waste with low dissolved solids	Nitrogenous fertilizers	4020672 G	1	99	DK	8
	Other aqueous waste with low dissolved solids	Nitrogenous fertilizers	365000 G	0.1	99	DK	8
	Other aqueous waste with low dissolved solids	Plating and polishing, Aircraft equipment	221 T	DK	80	N/A	2
	Other aqueous waste with low dissolved solids	Semiconductors and related devices, Electron tubes, receiving type, Electronic connectors	532078 T	1	99	DK	2
	Other aqueous waste with low dissolved solids	Services, nec	385 G	10	90	DK	8
Aqueous inorganic liquids	Scrubber water	Cyclic crudes and intermediates,Industrial organic chemicals, nec,Nitrogenous fertilizers	32875 T	0.8	99	N/A	2
	Scrubber water	Fabricated metal products, nec, Miscellaneous metal work	71250 G	20	70	N/A	9
	Scrubber water	Industrial organic chemicals, nec	2490 T	7	93	0	8
	Scrubber water	Manufacturing industries, nec	14000000 G	1	100	DK	7
	Scrubber water	Research and development laboratories	4896 G	15	85	0	7
Aqueous inorganic liquids	Wastewater or aqueous mixture	Coating, engraving, and allied services	122 T	DK	DK	DK	9
	Wastewater or aqueous mixture	DK	1150 G	N/A	N/A	N/A	2
	Wastewater or aqueous mixture	Electronic components, nec	110 G	0	85	0	4
	Wastewater or aqueous mixture	Electronic components, nec, Semiconductors and related devices, Electronic parts and equipment	150 G	10	90	0	4.3
	Wastewater or aqueous mixture	Fabricated metal products, nec, Metal office furniture, Public building and related furniture	360000 G	2	90	1	4
	Wastewater or aqueous mixture	General chemical manufacturing, Industrial inorganic chemicals, nec	615 G	1	98	0.6	4
	Wastewater or aqueous mixture	General chemical manufacturing, Soap and other detergents	615 G	1	99	0.4	4
	Wastewater or aqueous mixture	Industrial inorganic chemicals, nec	682419 G	10	90	0	7
	Wastewater or aqueous mixture	Industrial organic chemicals, nec	840 T	present	99	present	7
	Wastewater or aqueous mixture	Industrial organic chemicals, nec	75737 G	present	99	present	7
	Wastewater or aqueous mixture	Industrial organic chemicals, nec	17826 T	present	96	4	7.2
	Wastewater or aqueous mixture	Industrial organic chemicals, nec, Industrial inorganic chemicals, nec	482 T	17	99	0.1	10
	Wastewater or aqueous mixture	Marine cargo handling	1891587	2	98	DK	12
	Wastewater or aqueous mixture	Metals service centers and offices	100000 G	2	99	1	7
	Wastewater or aqueous mixture	Nitrogenous fertilizers	5000 G	1	99	DK	7
	Wastewater or aqueous mixture	Nonferrous rolling and drawing, nec, Metal stampings, nec, Fabricated metal products, nec	5 G	present	DK	DK	2
	Wastewater or aqueous mixture	Nonferrous wire drawing and insulating	44660 T	0	99	N/A	2
	Wastewater or aqueous mixture	Ordinance and accessories, nec	4076000 G	1	99	N/A	3
	Wastewater or aqueous mixture	Paints and allied products	2069541 G	DK	99	DK	12
	Wastewater or aqueous mixture	Pharmaceutical preparations	1763000 G	5	95	DK	4

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Aqueous inorganic liquids (continued)	Wastewater or aqueous mixture	Pharmaceutical preparations	1763000 G	5	95	DK	4
	Wastewater or aqueous mixture	Plastics materials and resins	258436 T	5	95	DK	9.5
	Wastewater or aqueous mixture	Plating and polishing	15602400 G	0	99	DK	5
	Wastewater or aqueous mixture	Plating and polishing	19995695 G	0	99	DK	5
	Wastewater or aqueous mixture	Plating and polishing	1440000 G	1	99	N/A	8.5
	Wastewater or aqueous mixture	Plating and polishing	1234640 G	1	99	N/A	8.5
	Wastewater or aqueous mixture	Plating and polishing	5000000 G	present	95	present	9
	Wastewater or aqueous mixture	Plating and polishing, Jewelry, precious metal	6376139 G	1	99	0	2
	Wastewater or aqueous mixture	Plating and polishing, Jewelry, precious metal	36000 G	6	94	DK	12
	Wastewater or aqueous mixture	Pressed and blown glass, nec, Electric lamps	4800000 G	present	present	present	6
	Wastewater or aqueous mixture	Primary metal products, nec, Electronic components, nec, Fabricated metal products, nec	8 T	present	present	DK	8
	Wastewater or aqueous mixture	Secondary nonferrous metals, Motor vehicle parts and accessories	5096000 G	DK	99	present	2
	Wastewater or aqueous mixture	Semiconductors and related devices	84000000 G	1	99	1	2
	Wastewater or aqueous mixture	Semiconductors and related devices	143500 T	DK	99	DK	7
	Wastewater or aqueous mixture	Semiconductors and related devices	70 G	DK	99	DK	7
	Wastewater or aqueous mixture	Surface active agents,Industrial organic chemicals, nec	55918 G	10	80	10	2
	Wastewater or aqueous mixture	Switchgear and sitchboard apparatus	17400000 G	0	99	0	2
	Wastewater or aqueous mixture	Tanks and tank components	123 T	4	98	DK	11
	Wastewater or aqueous mixture	Valves and pipe fittings	250 G	DK	95	DK	11
Contaminated soil	Contaminated soil or cleanup residue	Electronic components, nec	6 T	98	2	DK	8
	Contaminated soil or cleanup residue	Miscellaneous plastics products, Plastics materials and resins	41 T	2	15	DK	9
Contaminated soil	Soil contaminated with inorganics only	Industrial inorganic chemicals, nec	455 T	99	1	N/A	2
	Soil contaminated with inorganics only	Industrial inorganic chemicals, nec	2311 T	90	10	DK	2
	Soil contaminated with inorganics only	Industrial organic chemicals, nec	1 T	99	N/A	N/A	2
	Soil contaminated with inorganics only	Manufacturing industries, nec	1 T	95	2	0	4
Contaminated soil	Soil contaminated with organics	Miscellaneous plastics products, Sporting and athletic goods, nec	0	99	1	0	8
	Soil contaminated with organics	Synthetic rubber	259 T	95	5	1	2
Inorganic liquids	Caustic solution with metals and cyanides	Electronic components, nec	7066 G	6	94	1	10
	Caustic solution with metals and cyanides	Electronic computing equipment	1 T	50	DK	DK	12
	Caustic solution with metals and cyanides	Plating and polishing,Metal coating and allied services, Electronic components, nec	50 G	1	90	0	10
	Caustic solution with metals and cyanides	Telephone communication	165 G	11	87	0	12
Inorganic liquids	Caustic solution with metals but no cyanides	Aircraft	47 T	34	DK	N/A	11
	Caustic solution with metals but no cyanides	Aircraft	36 T	80	20	N/A	12
	Caustic solution with metals but no cyanides	Aircraft engines and engine parts	240 G	1	DK	DK	12
	Caustic solution with metals but no cyanides	Aircraft equipment, nec	0	5.4	DK	DK	10
	Caustic solution with metals but no cyanides	Aircraft equipment, nec, Miscellaneous metal work, Fabricated metal products, nec	48 G	6	4	DK	2
	Caustic solution with metals but no cyanides	Aluminum extruded products	28560 G	20	80	N/A	12
	Caustic solution with metals but no cyanides	Aluminum rolling and drawing, nec, Aluminum extruded products	178 T	DK	90	DK	9
	Caustic solution with metals but no cyanides	Automotive stampings, Metal coating and allied services	4 T	98	2	present	6
	Caustic solution with metals but no cyanides	Current-carrying wiring devices	1300 G	0	80	0	9
	Caustic solution with metals but no cyanides	Current-carrying wiring devices,Electron tubes, transmitting,Electronic components, nec	61200 G	10	89	0	11
	Caustic solution with metals but no cyanides	Cutlery	4444 G	DK	present	DK	10
	Caustic solution with metals but no cyanides	Cyclic crudes and intermediates,Industrial organic chemicals, nec	96200 T	1	95	1	11
	Caustic solution with metals but no cyanides	DK	3876000 G	2	97	N/A	12
	Caustic solution with metals but no cyanides	Electrical equipment and supplies, nec	11395 G	1	99	0	9
	Caustic solution with metals but no cyanides	Electron tubes, transmitting	700 G	present	89	DK	12
	Caustic solution with metals but no cyanides	Electronic components, nec	3636 G	2	70	DK	2
	Caustic solution with metals but no cyanides	Electronic components, nec	86676 G	present	present	DK	5
	Caustic solution with metals but no cyanides	Electronic components, nec	DK	17	DK	DK	8
	Caustic solution with metals but no cyanides	Electronic components, nec	25500 G	0	89	DK	8
	Caustic solution with metals but no cyanides	Electronic components, nec	559 T	DK	DK	DK	8
	Caustic solution with metals but no cyanides	Electronic components, nec	121 T	20	80	DK	8
	Caustic solution with metals but no cyanides	Electronic components, nec	16885 G	20	70	0	8.8
	Caustic solution with metals but no cyanides	Electronic components, nec	20975 G	present	90	0	9
	Caustic solution with metals but no cyanides	Electronic components, nec	36000 G	N/A	present	DK	9
	Caustic solution with metals but no cyanides	Electronic components, nec	4 T	DK	60	DK	9
	Caustic solution with metals but no cyanides	Electronic components, nec	31 T	50	50	1	9

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic liquids (continued)	Caustic solution with metals but no cyanides	Electronic components, nec	408 T	50	50	1	9
	Caustic solution with metals but no cyanides	Electronic components, nec	553 T	1	present	N/A	9
	Caustic solution with metals but no cyanides	Electronic components, nec	45 T	DK	DK	DK	10
	Caustic solution with metals but no cyanides	Electronic components, nec	3655 G	DK	50	DK	10
	Caustic solution with metals but no cyanides	Electronic components, nec	1800 G	present	70	present	11
	Caustic solution with metals but no cyanides	Electronic components, nec	72 T	DK	DK	DK	11
	Caustic solution with metals but no cyanides	Electronic components, nec	480 G	DK	present	DK	12
	Caustic solution with metals but no cyanides	Electronic components, nec	211 G	N/A	80	N/A	12
	Caustic solution with metals but no cyanides	Electronic components, nec	60 G	N/A	65	N/A	12
	Caustic solution with metals but no cyanides	Electronic computing equipment	5000 G	present	99	present	10
	Caustic solution with metals but no cyanides	Electronic computing equipment	4943 G	present	80	N/A	10
	Caustic solution with metals but no cyanides	Electronic resistors	495 G	13	87	N/A	12
	Caustic solution with metals but no cyanides	Environmental controls	2310 G	17	80	DK	12
	Caustic solution with metals but no cyanides	Fabricated metal products, nec	10850 G	0	98	DK	7
	Caustic solution with metals but no cyanides	Fabricated metal products, nec	8910 G	44	56	DK	10
	Caustic solution with metals but no cyanides	Industrial supplies	39 T	60	40	DK	12
	Caustic solution with metals but no cyanides	Instruments to measure electricity, Process control instruments	4845 G	present	93	DK	8
	Caustic solution with metals but no cyanides	Internal combustion engines, nec, Manufacturing industries, nec	1324000 G	25	55	1	12
	Caustic solution with metals but no cyanides	Manufacturing industries, nec	2585 G	DK	90	N/A	2
	Caustic solution with metals but no cyanides	Manufacturing industries, nec, Electronic components, nec, Current-carrying wiring devices	4850 G	15	40	N/A	8
	Caustic solution with metals but no cyanides	Metal coating and allied services	218 T	2	98	0	10
	Caustic solution with metals but no cyanides	Metal coating and allied services, Tanks and tank components, Transportation equipment, nec	11 T	present	present	present	12.5
	Caustic solution with metals but no cyanides	Metal heat treating, Steel wire and related products	254 G	present	present	present	2
	Caustic solution with metals but no cyanides	miscellaneous fabricated wire products	3850 G	5	95	0	12
	Caustic solution with metals but no cyanides	Miscellaneous metal work	3 T	DK	99	DK	8
	Caustic solution with metals but no cyanides	Miscellaneous metal work, Metal coating and allied services, Aircraft	13 T	present	present	N/A	5
	Caustic solution with metals but no cyanides	Motor vehicle parts and accessories	33 T	DK	70	DK	12
	Caustic solution with metals but no cyanides	Motors and generators	55 G	DK	DK	DK	6.8
	Caustic solution with metals but no cyanides	National security	631 G	0	0	0	10
	Caustic solution with metals but no cyanides	National security	1 T	0	0	DK	12
	Caustic solution with metals but no cyanides	National security, Plating and polishing,Metal coating and allied services	9075 G	present	present	N/A	11
	Caustic solution with metals but no cyanides	Plating and polishing	18 T	DK	99	DK	8
	Caustic solution with metals but no cyanides	Plating and polishing	64500 G	DK	DK	DK	10
	Caustic solution with metals but no cyanides	Plating and polishing	DK	20	80	N/A	10
	Caustic solution with metals but no cyanides	Plating and polishing	4000 G	10	90	N/A	10
	Caustic solution with metals but no cyanides	Plating and polishing	220 G	present	80	N/A	10
	Caustic solution with metals but no cyanides	Plating and polishing	2250 G	N/A	N/A	N/A	11
	Caustic solution with metals but no cyanides	Plating and polishing	2475 G	0	92	DK	12
	Caustic solution with metals but no cyanides	Plating and polishing	5250 G	DK	DK	DK	12
	Caustic solution with metals but no cyanides	Plating and polishing, Electronic components, nec	10000 G	DK	90	present	12
	Caustic solution with metals but no cyanides	Plating and polishing, Electronic components, nec	8000 G	DK	85	N/A	2
	Caustic solution with metals but no cyanides	Plating and polishing,Metal coating and allied services, Electronic components, nec	840 G	DK	66	N/A	12
	Caustic solution with metals but no cyanides	Plating and polishing,Metal household furniture, Metal office furniture	5190 G	1	99	0	12
	Caustic solution with metals but no cyanides	Primary metal products, nec	213600 G	5	95	N/A	12
	Caustic solution with metals but no cyanides	Radio and TV communication equipment	40800 G	DK	DK	DK	7.2
	Caustic solution with metals but no cyanides	Radio and TV communication equipment	59 T	15	85	DK	10
	Caustic solution with metals but no cyanides	Radio and TV communication equipment,Electronic components, nec	1250 G	DK	DK	DK	11
	Caustic solution with metals but no cyanides	Research and development laboratories	12 T	DK	63	0	10
	Caustic solution with metals but no cyanides	Semiconductors and related devices	400 G	4	96	0	12
	Caustic solution with metals but no cyanides	Semiconductors and related devices, Electron tubes, receiving type, Electronic connectors	220 G	5	90	DK	10
	Caustic solution with metals but no cyanides	Semiconductors and related devices, Electron tubes, receiving type, Electronic connectors	1 T	15	80	DK	9
	Caustic solution with metals but no cyanides	Ship building and repairing	4 T	60	35	DK	9
	Caustic solution with metals but no cyanides	Speed changers, drives, and gears, Aircraft equipment	35200 G	DK	DK	DK	9.8
	Caustic solution with metals but no cyanides	Steel pipe and tubes	15284 G	DK	90	DK	10
	Caustic solution with metals but no cyanides	Steel pipe and tubes	153 T	12	88	DK	10
	Caustic solution with metals but no cyanides	Tanks and tank components	3794 G	15	DK	DK	12
	Caustic solution with metals but no cyanides	Telephone and telegraph apparatus, Semiconductors and related devices,Radio and TV communication eq	1 T	15	85	DK	12
	Caustic solution with metals but no cyanides	Telephone and telegraph apparatus, Semiconductors and related devices,Radio and TV communication eq	4300 G	40	60	0	9
	Caustic solution with metals but no cyanides	Telephone communication	440 G	10	79	0	10
	Caustic solution with metals but no cyanides	Turbines and turbine generator sets	2 T	5	95	DK	12
	Caustic solution with metals but no cyanides		12400 G	DK	DK	DK	8.2

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic liquids	Other aqueous waste with high dissolved solids	Agricultural chemicals, nec	8140 T	17	75	N/A	12
	Other aqueous waste with high dissolved solids	Chemical preparations, nec	1072500 G	present	90	N/A	12
	Other aqueous waste with high dissolved solids	Cyclic crudes and intermediates	3942 T	10	88	present	2
	Other aqueous waste with high dissolved solids	DK	352 T	16	84	0	9
	Other aqueous waste with high dissolved solids	Electrical equipment and supplies, nec	22823 G	5	95	0	9
	Other aqueous waste with high dissolved solids	Engineering and scientific instruments, Surgical and medical instruments	78 G	1	80	1	12
	Other aqueous waste with high dissolved solids	General chemical manufacturing	250000 G	20	80	5	9
	Other aqueous waste with high dissolved solids	Industrial inorganic and organic chemicals, nec, Nitrogenous fertilizers	DK	present	present	DK	10
	Other aqueous waste with high dissolved solids	Metal coating and allied services	50 T	1	99	1	12
	Other aqueous waste with high dissolved solids	Plating and polishing,Metal coating and allied services, Coating, engraving, and allied services	20000 G	present	present	present	9
	Other aqueous waste with high dissolved solids	Refuse systems	419 T	20	80	5	11
Inorganic liquids	Other inorganic liquid	Agricultural chemicals, nec, Organic pesticide products, Water supply	150000 G	1	99	present	7
	Other inorganic liquid	Air, water, and solid waste management	23 T	DK	99	1	9
	Other inorganic liquid	Aircraft engines and engine parts	48 G	2	DK	DK	2
	Other inorganic liquid	Ammunition, except for small arms, nec	DK	present	present	DK	12
	Other inorganic liquid	Biological products	120 G	DK	75	N/A	7.5
	Other inorganic liquid	Blast furnaces and steel mills	20 T	DK	DK	DK	3
	Other inorganic liquid	Chemical preparations, nec	24 T	0	81	N/A	4
	Other inorganic liquid	Chemical preparations, nec, Industrial inorganic chemicals, nec	50 T	2	98	DK	2
	Other inorganic liquid	DK	646325 G	20	80	N/A	7
	Other inorganic liquid	Electron tubes, transmitting, X-ray apparatus and tubes	7014 T	2	98	DK	2
	Other inorganic liquid	Electronic components, nec	10 G	DK	DK	DK	2
	Other inorganic liquid	Electronic components, nec	120 G	1	10	N/A	12
	Other inorganic liquid	Electronic components, nec	2645 G	DK	DK	DK	12
	Other inorganic liquid	Electronic connectors	38 G	N/A	N/A	DK	2
	Other inorganic liquid	Engineering and scientific instruments	38966560 G	DK	DK	DK	7
	Other inorganic liquid	Fabricated structural metal	9720 G	15	present	DK	3
	Other inorganic liquid	Industrial inorganic chemicals, nec, Chemical preparations, nec	46 T	2	98	DK	12
	Other inorganic liquid	Industrial organic chemicals, nec	4760000 G	0	99	0	2
	Other inorganic liquid	Machinery, except electrical, nec	4775000 G	present	99	N/A	3
	Other inorganic liquid	Miscellaneous metal work	9900 G	5	90	DK	8.5
	Other inorganic liquid	Motor vehicles and car bodies	440 G	DK	DK	N/A	2
	Other inorganic liquid	Nitrogenous fertilizers	1396783 T	0	0	DK	7
	Other inorganic liquid	Ordinance and accessories, nec	55 G	DK	DK	DK	2
	Other inorganic liquid	Pens and mechanical pencils, Plating and polishing	825000 G	present	99	0	2
	Other inorganic liquid	Pharmaceutical preparations,Drugs, proprietaries, and sundries,Research and development labs	531400 G	0	97	9	12
	Other inorganic liquid	Power driven hand tools	8400 G	3	DK	N/A	5
	Other inorganic liquid	Railroads, line-haul operating, Railroad equipment	58300 G	present	87	0	12.5
	Other inorganic liquid	Research and development laboratories	2550000 G	DK	99	DK	7
	Other inorganic liquid	Services, nec, Chemicals and allied products	860 T	1	99	DK	3
	Other inorganic liquid	Water supply	1 T	DK	DK	N/A	10
Inorganic liquids	Other inorganic sludge	Aircraft	275 G	98	DK	DK	7
	Other inorganic sludge	Aircraft engines and engine parts	744 G	DK	DK	DK	2
	Other inorganic sludge	Aircraft engines and engine parts	5800 G	50	50	DK	4
	Other inorganic sludge	Aircraft engines and engine parts	150 G	50	50	DK	4
	Other inorganic sludge	Aircraft engines and engine parts	72 G	DK	DK	DK	12
	Other inorganic sludge	Aircraft equipment, nec	5000 G	98	DK	DK	12
	Other inorganic sludge	Aircraft, Space propulsion units and parts	1540 G	80	DK	DK	2
	Other inorganic sludge	Blast furnaces and steel mills	41 T	32	50	0.003	2
	Other inorganic sludge	Electronic components, nec	118 G	N/A	60	DK	2
	Other inorganic sludge	Fabricated metal products, nec	0	98	2	DK	12
	Other inorganic sludge	Household appliances, nec, Household cooking equipment, Household refrigerators and freezers	87 T	60	DK	N/A	4
	Other inorganic sludge	Industrial inorganic chemicals, nec	12 T	99	0	present	3
	Other inorganic sludge	Industrial organic chemicals, nec, Cyclic crudes and intermediates,Synthetic rubber	171 T	20	80	present	2
	Other inorganic sludge	Petroleum refining	864 T	52	48	N/A	12
	Other inorganic sludge	Plating and polishing	9 T	25	75	DK	3
	Other inorganic sludge	Sanitary services, nec	55 G	92	8	N/A	2
	Other inorganic sludge	Sanitary services, nec	1 T	99	1	N/A	11
	Other inorganic sludge	Space research and technology	3 G	70	0	DK	2
	Other inorganic sludge	Steel pipe and tubes	216 G	44	N/A	N/A	2

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic liquids (continued)	Other inorganic sludge	Steel pipe and tubes	4400 G	10	85	0	10
	Other inorganic sludge	Tanks and tank components	26 T	30	70	DK	12
Inorganic liquids	Spent acid with metals	Aircraft	54 T	DK	DK	N/A	2
	Spent acid with metals	Aircraft	6 T	DK	DK	N/A	2
	Spent acid with metals	Aircraft	332 G	DK	DK	N/A	2
	Spent acid with metals	Aircraft	10 T	64	DK	N/A	12
	Spent acid with metals	Aircraft	47 T	64	DK	N/A	12
	Spent acid with metals	Aircraft	50 G	64	DK	N/A	12
	Spent acid with metals	Aircraft engines and engine parts	9072 T	1	DK	DK	2
	Spent acid with metals	Aircraft engines and engine parts	216 G	2	DK	DK	2
	Spent acid with metals	Aircraft engines and engine parts	1104	DK	DK	DK	2
	Spent acid with metals	Aircraft engines and engine parts	20995 G	5	80	DK	4
	Spent acid with metals	Aircraft engines and engine parts	5305 G	5	80	DK	4
	Spent acid with metals	Aircraft engines and engine parts	96 G	DK	DK	DK	12
	Spent acid with metals	Aluminum rolling and drawing, nec, Aluminum extruded products	26 T	DK	85	DK	2
	Spent acid with metals	Aluminum rolling and drawing, nec, Aluminum extruded products	7 T	DK	90	DK	2
	Spent acid with metals	Ammunition, except for small arms, nec	78 T	DK	50	DK	2
	Spent acid with metals	Ammunition, except for small arms, nec,Metal stampings, nec, Metal coating and allied services	205806 T	1	99	1	4
	Spent acid with metals	Automotive stampings	6 T	80	15	present	2
	Spent acid with metals	Blast furnaces and steel mills	3388 T	5	95	0	12
	Spent acid with metals	Bolts, nuts, rivets, and washers	27500 G	25	72	N/A	6
	Spent acid with metals	Book printing	110 G	DK	DK	DK	4
	Spent acid with metals	Chemical preparations, nec, Metal coating and allied services,Fabricated metal products, nec	12750 G	DK	90	DK	2
	Spent acid with metals	Coating, engraving, and allied services	3600 G	DK	90	DK	2
	Spent acid with metals	Colleges and universities,nec, Medical laboratories	308 G	DK	DK	DK	2
	Spent acid with metals	Commercial printing, gravure	580 T	2	98	1	2
	Spent acid with metals	Construction machinery	2400 G	2	98	DK	2
	Spent acid with metals	Costume jewelry	55 G	10	30	DK	2
	Spent acid with metals	Costume jewelry	165 G	25	40	DK	4
	Spent acid with metals	Current-carrying wiring devices	55 G	1	DK	DK	2
	Spent acid with metals	Current-carrying wiring devices,Electron tubes, transmitting,Electronic components, nec	71900 G	10	88	0	2
	Spent acid with metals	Cyclic crudes and intermediates,Industrial organic chemicals, nec	27489 T	1	95	1	2
	Spent acid with metals	DK	326584 G	29	70	present	2
	Spent acid with metals	DK	0	DK	present	0	2
	Spent acid with metals	DK	DK	DK	DK	DK	5
	Spent acid with metals	DK	41 T	99	1	0	7
	Spent acid with metals	Electric services	514100 G	1	99	N/A	2
	Spent acid with metals	Electric services	400000 G	1	99	N/A	2
	Spent acid with metals	Electric services	200000 G	1	99	N/A	2
	Spent acid with metals	Electric services	16751 T	DK	99	DK	2
	Spent acid with metals	Electric services	1972758 G	DK	DK	DK	2
	Spent acid with metals	Electric services	1000000 G	1	99	0	2
	Spent acid with metals	Electric services	0	DK	DK	N/A	4
	Spent acid with metals	Electrometallurgical products	41000 G	DK	DK	DK	2
	Spent acid with metals	Electronic	55 G	DK	DK	DK	2
	Spent acid with metals	Electronic components, nec	150 G	DK	DK	0	2
	Spent acid with metals	Electronic components, nec	5 T	0	75	0	2
	Spent acid with metals	Electronic components, nec	5340 G	5	93	1	2
	Spent acid with metals	Electronic components, nec	39 T	5	DK	DK	2
	Spent acid with metals	Electronic components, nec	49796 G	0	90	present	2
	Spent acid with metals	Electronic components, nec	5 G	DK	DK	DK	2
	Spent acid with metals	Electronic components, nec	643 G	0	75	present	2
	Spent acid with metals	Electronic components, nec	60 G	N/A	75	present	2
	Spent acid with metals	Electronic components, nec	257 G	N/A	95	N/A	2
	Spent acid with metals	Electronic components, nec	60 G	N/A	90	N/A	2
	Spent acid with metals	Electronic components, nec	521 G	N/A	90	N/A	2
	Spent acid with metals	Electronic components, nec	343 G	N/A	90	DK	2
	Spent acid with metals	Electronic components, nec	194 G	N/A	80	N/A	2
	Spent acid with metals	Electronic components, nec	50 G	1	98	DK	2
	Spent acid with metals	Electronic components, nec	5200 G	10	90	N/A	2
	Spent acid with metals	Electronic components, nec	16392 G	1	98	0.5	2.9

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic liquids (continued)	Spent acid with metals	Electronic components, nec	770 G	10	90	0	3
	Spent acid with metals	Electronic components, nec	220 G	DK	90	N/A	3
	Spent acid with metals	Electronic components, nec	98 G	N/A	50	present	3
	Spent acid with metals	Electronic components, nec	600 G	1	85	0	3
	Spent acid with metals	Electronic components, nec	2400 G	0	97	0	7
	Spent acid with metals	Electronic components, nec	13 T	DK	DK	DK	11
	Spent acid with metals	Electronic components, nec, Semiconductors and related devices	DK	1	97	1	2
	Spent acid with metals	Electronic computing equipment	13522500 G	present	90	present	2
	Spent acid with metals	Electronic computing equipment	1 T	5	85	N/A	2
	Spent acid with metals	Electronic computing equipment	4 T	10	80	present	2
	Spent acid with metals	Electronic computing equipment	14 T	30	95	0	2
	Spent acid with metals	Electronic computing equipment	9 T	10	95	DK	2
	Spent acid with metals	Electronic computing equipment	5 T	30	85	0	2
	Spent acid with metals	Electronic computing equipment	1 T	20	85	0	2
	Spent acid with metals	Electronic computing equipment	4 T	20	90	DK	2
	Spent acid with metals	Engine electrical equipment	140 G	0	present	0	3
	Spent acid with metals	Engraving and plate printing	500 G	present	90	N/A	2
	Spent acid with metals	Fabricated metal products, nec	19342 G	DK	DK	DK	2
	Spent acid with metals	Fabricated metal products, nec, Plating and polishing	1200 G	DK	80	N/A	2
	Spent acid with metals	Fabricated metal products, nec, Plating and polishing	1500 G	DK	80	N/A	2
	Spent acid with metals	Fabricated metal products, nec, Plating and polishing	4500 G	DK	80	N/A	2
	Spent acid with metals	Fabricated metal products, nec, Power transmission equipment, nec,Farm machinery and equipment	1500 T	present	present	DK	2
	Spent acid with metals	Fabricated plate work,Sheet metal work, Fabricated metal products, nec	11300 G	15	50	0	4
	Spent acid with metals	Fabricated structural metal	97433 G	15	present	DK	2
	Spent acid with metals	Farm machinery and equipment	58 T	DK	DK	DK	2
	Spent acid with metals	Guided missiles and space vehicles, Aircraft, Aircraft equipment, nec	DK	3	70	N/A	2
	Spent acid with metals	Hand and edge tools, nec, Hand saws and saw blades, Machine tool accessories	835 G	DK	DK	1	12
	Spent acid with metals	Hardware, nec, Aircraft equipment, nec, Fabricated metal products, nec	6650 G	28	74	DK	3
	Spent acid with metals	Household cooking equipment	22644000 G	0.1	86	DK	2
	Spent acid with metals	Industrial inorganic chemicals, nec	20 T	DK	present	DK	5.5
	Spent acid with metals	Iron ores	3650 G	present	90	N/A	8
	Spent acid with metals	Lithographic platemaking services, Photoengraving, Engraving and plate printing	1 T	present	present	DK	2
	Spent acid with metals	Lithographic platemaking services, Photoengraving, Engraving and plate printing	15 T	present	present	DK	2
	Spent acid with metals	Measuring and controlling devices, nec	DK	present	5	DK	2
	Spent acid with metals	Metal coating and allied services	1339 T	DK	80	DK	2
	Spent acid with metals	Metal coating and allied services	1468 T	4	96	0	2
	Spent acid with metals	Metal coating and allied services	270 T	9	80	DK	2
	Spent acid with metals	Metal coating and allied services	1025679 T	present	99	DK	6
	Spent acid with metals	miscellaneous fabricated wire products	7500 G	6	94	0	2
	Spent acid with metals	Miscellaneous metal work	8 T	DK	99	DK	2
	Spent acid with metals	Miscellaneous metal work	DK	N/A	N/A	N/A	7.7
	Spent acid with metals	Miscellaneous plastics products	3500 G	5	90	DK	2
	Spent acid with metals	Motor vehicles and car bodies	14815 G	12	96	0	3
	Spent acid with metals	National security	255 G	0	present	0	2
	Spent acid with metals	National security	75 G	N/A	N/A	N/A	2
	Spent acid with metals	National security	0	DK	DK	DK	2
	Spent acid with metals	Nonclassifiable establishment	1155 G	present	present	DK	3
	Spent acid with metals	Paper industries machinery, Machinery, except electrical, nec	220 G	DK	85	0	2.2
	Spent acid with metals	Photoengraving	9900 G	30	70	0	9.5
	Spent acid with metals	Photographic equipment and supplies	3 T	N/A	80	0	2
	Spent acid with metals	Plating and polishing	204000 G	DK	DK	0	2
	Spent acid with metals	Plating and polishing	19040 G	1	DK	DK	2
	Spent acid with metals	Plating and polishing	400 G	DK	DK	DK	2
	Spent acid with metals	Plating and polishing	300 G	5	60	DK	2
	Spent acid with metals	Plating and polishing	50 G	5	60	DK	2
	Spent acid with metals	Plating and polishing	1155 G	DK	80	DK	2
	Spent acid with metals	Plating and polishing	5 T	0	76	DK	2.5
	Spent acid with metals	Plating and polishing	245 T	DK	DK	DK	3.6
	Spent acid with metals	Plating and polishing	9 T	DK	99	DK	4
	Spent acid with metals	Plating and polishing	6826200 G	1	99	0	4
	Spent acid with metals	Plating and polishing	5550 G	DK	99	DK	4
	Spent acid with metals	Plating and polishing	3 T	0	80	DK	4.5

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic liquids (continued)	Spent acid with metals	Plating and polishing	110 G	94	6	DK	6
	Spent acid with metals	Plating and polishing, Silverware and plated ware,Metal coating and allied services	2200 G	10	30	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services	9819000 G	0	95	0	3
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	18925 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	1150 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	1700 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	3150 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	2200 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	4000 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	750 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	950 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	50 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	1800 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	450 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	350 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	700 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	1000 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	50 G	1	99	0	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	675 T	0.5	DK	DK	2
	Spent acid with metals	Plating and polishing,Metal coating and allied services, Electronic components, nec	10950 G	1	99	0	3
	Spent acid with metals	Plating and polishing,Metal household furniture, Metal office furniture	5000 G	5	70	DK	8
	Spent acid with metals	Primary metal products, nec	170400 G	7	93	N/A	3
	Spent acid with metals	Process control instruments	35000 G	2	98	N/A	2
	Spent acid with metals	Radio and TV communication equipment	330 G	DK	DK	DK	2
	Spent acid with metals	Radio and TV communication equipment	15 T	10	95	1	2
	Spent acid with metals	Research and development laboratories	10 T	DK	DK	DK	2
	Spent acid with metals	Research and development laboratories	165 G	present	present	DK	2
	Spent acid with metals	Screw machine products	495 G	19	DK	DK	2
	Spent acid with metals	Secondary nonferrous metals	5 G	2	98	DK	8
	Spent acid with metals	Semiconductors and related devices	14800 G	1	90	DK	3
	Spent acid with metals	Services, nec	2000 G	0	99	0	2
	Spent acid with metals	Services, nec	12415 G	10	90	N/A	2
	Spent acid with metals	Ship building and repairing	22000 G	2	99	N/A	2
	Spent acid with metals	Ship building and repairing	2112 G	DK	99	DK	2.2
	Spent acid with metals	Ship building and repairing	3466 G	DK	98	DK	2.7
	Spent acid with metals	Space research and technology	3950 G	DK	98	DK	11
	Spent acid with metals	Special warehousing and storage, nec	5 G	5	0	DK	4
	Spent acid with metals	Speed changers, drives, and gears, Aircraft equipment	165 G	1	0	0	2
	Spent acid with metals	Steel pipe and tubes	9289 G	DK	60	DK	2
	Spent acid with metals	Steel wire and related products	35 T	N/A	99	DK	2
	Spent acid with metals	Surgical and medical instruments	800000 G	1	99	1	2
	Spent acid with metals	Telephone and telegraph apparatus,Semiconductors and related devices	25 T	DK	95	N/A	7
	Spent acid with metals	Telephone and telegraph apparatus,Semiconductors and related devices	3600 G	1	33	0	2
	Spent acid with metals	Telephone communication	20000 G	1	94	DK	8
	Spent acid with metals	Valves and pipe fittings	3912 G	2	98	DK	3
	Spent acid with metals	Valves and pipe fittings	660 G	DK	70	DK	2
	Spent acid with metals	Valves and pipe fittings	DK	0	71	0	2
			6 T	present	98	present	2
Inorganic liquids	Spent acid without metals	Aircraft	36 T	6.1	DK	N/A	2
	Spent acid without metals	Aircraft engines and engine parts	624 G	DK	DK	DK	2
	Spent acid without metals	Aircraft equipment, nec	5500 G	18	DK	DK	3
	Spent acid without metals	Cellulosic man-made fibers	125 T	80	15	1	3
	Spent acid without metals	Cellulosic man-made fibers	119 T	75	15	1	4
	Spent acid without metals	Cyclic crudes and intermediates	2439140 G	DK	95	0	2
	Spent acid without metals	Cyclic crudes and intermediates, Photographic equipment and supplies	0	25	0	20	7
	Spent acid without metals	DK	3200 G	DK	50	DK	7.25
	Spent acid without metals	Electric services	0	DK	DK	DK	4
	Spent acid without metals	Electric services	200000 G	1	99	1	7
	Spent acid without metals	Electronic components, nec	5 G	DK	DK	DK	2
	Spent acid without metals	Electronic components, nec	30 G	DK	DK	DK	2
	Spent acid without metals	Electronic components, nec	10 G	DK	DK	DK	5.4

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic liquids (continued)	Spent acid without metals	Explosives, Industrial inorganic chemicals, nec	354400 T	1	99	0	2
	Spent acid without metals	Fabricated metal products, nec	DK	DK	DK	DK	2
	Spent acid without metals	Fabricated metal products, nec	110 G	DK	80	DK	2
	Spent acid without metals	General automotive repair shops	168 G	N/A	68	N/A	7
	Spent acid without metals	General chemical manufacturing	1387 T	10	30	0	2
	Spent acid without metals	Guided missiles and space vehicles	150 G	90	DK	N/A	3
	Spent acid without metals	Industrial controls	4720 G	DK	70	N/A	2
	Spent acid without metals	Industrial inorganic chemicals, nec	20423 T	0	98	0	2
	Spent acid without metals	Industrial organic chemicals, nec	20 T	0	30	45	2
	Spent acid without metals	Industrial organic chemicals, nec	40000 G	8	96	6	2
	Spent acid without metals	Industrial organic chemicals, nec	110 G	DK	10	0	2
	Spent acid without metals	Industrial organic chemicals, nec, Industrial inorganic chemicals, nec,General chemical manufacturing	266244 T	DK	65	1	2
	Spent acid without metals	Metal coating and allied services	5000 G	1	99	N/A	2
	Spent acid without metals	Metal coating and allied services	22 T	1	98	0	5
	Spent acid without metals	Metal coating and allied services, Metal heat treating, Primary metal products, nec	249024 G	12	88	1	2
	Spent acid without metals	Metal coating and allied services, Metal heat treating, Primary metal products, nec	571750 G	12	88	1	2
	Spent acid without metals	Metal stampings, nec	13500 G	100	0	0	2
	Spent acid without metals	Miscellaneous metal work	20000 G	5	90	DK	12
	Spent acid without metals	Motor vehicle parts and accessories	7800 G	0	50	0	2
	Spent acid without metals	Motor vehicles and car bodies	600 G	0	99	0	2
	Spent acid without metals	National security	144 G	DK	DK	DK	2
	Spent acid without metals	National security	0	DK	DK	DK	2
	Spent acid without metals	National security	0	DK	DK	DK	2
	Spent acid without metals	National security	2 T	DK	DK	DK	2
	Spent acid without metals	National security, Aircraft	150 G	present	present	N/A	2
	Spent acid without metals	Noncommercial research organizations	3 T	15	75	N/A	3.5
	Spent acid without metals	Organic fibers, noncellulosic	13517 T	4	97	0	2
	Spent acid without metals	Organic fibers, noncellulosic, Plastics materials and resins	1 T	0	40	N/A	2
	Spent acid without metals	Petroleum refining	62315 T	1	95	DK	2
	Spent acid without metals	Petroleum refining	170 T	DK	present	present	10
	Spent acid without metals	Pharmaceutical preparations	2 T	N/A	5	N/A	2
	Spent acid without metals	Plastics materials and resins, Industrial organic chemicals, nec	304553 T	2	98	present	7
	Spent acid without metals	Plating and polishing	74 G	3	87	present	2
	Spent acid without metals	Plating and polishing	600 G	0	65	0	2
	Spent acid without metals	Plating and polishing	500 G	0	30	0	2
	Spent acid without metals	Products of purchased glass	3 T	0	80	0	2
	Spent acid without metals	Pulp mills	1200 G	DK	DK	DK	2
	Spent acid without metals	Repair services, nec	93 T	0	99	0	2
	Spent acid without metals	Research and development laboratories	58 G	25	DK	75	2
	Spent acid without metals	Secondary nonferrous metals, Aluminum rolling and drawing, nec, Nonferrous rolling and drawing, nec	17280 G	DK	1	DK	7
	Spent acid without metals	Semiconductors and related devices	34136 G	present	90	N/A	8
	Spent acid without metals	Semiconductors and related devices	804685 T	1	99	1	7
	Spent acid without metals	Semiconductors and related devices	272394 G	DK	99	0	7
	Spent acid without metals	Semiconductors and related devices	6000000 G	DK	present	DK	9
	Spent acid without metals	Ship building and repairing	2 T	DK	DK	DK	2
	Spent acid without metals	Ship building and repairing	2 T	DK	DK	DK	2
	Spent acid without metals	Space research and technology	5 G	10	50	DK	3
	Spent acid without metals	Steel investment foundries	120 G	present	80	N/A	2
	Spent acid without metals	Surface active agents, Industrial organic chemicals, nec, Chemical preparations, nec	83 T	DK	DK	DK	2
Inorganic liquids	Spent caustic	Aircraft engines and engine parts	5400 G	DK	DK	DK	12
	Spent caustic	Aircraft engines and engine parts	2568 G	DK	DK	DK	12
	Spent caustic	Aircraft engines and engine parts	300 G	DK	DK	DK	12
	Spent caustic	Blast furnaces and steel mills	66 T	30	70	DK	12
	Spent caustic	Certified air transportation	5 T	8	DK	DK	12
	Spent caustic	Colleges and universities, nec	50 G	DK	present	0	12
	Spent caustic	Colleges and universities,nec, Medical laboratories	142 G	DK	DK	DK	9
	Spent caustic	Current-carrying wiring devices,Electronic components, nec, Electronic parts and equipment	854 G	DK	DK	0	9
	Spent caustic	DK	577749 G	5	90	DK	12
	Spent caustic	DK	49839 T	10	88	0	12
	Spent caustic	Electric services	2454105 G	DK	DK	DK	7
	Spent caustic	Electrical apparatus and equipment, Electronic parts and equipment	4000 G	DK	90	DK	12

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic liquids (continued)	Spent caustic	Electronic components, nec	55 G	DK	DK	DK	12
	Spent caustic	Electronic computing equipment	0	present	present	present	10
	Spent caustic	Gaskets, packing, and sealing devices, Fabricated rubber products, nec	330 G	present	DK	DK	10
	Spent caustic	Industrial gases	8 T	10	80	0	10
	Spent caustic	Internal combustion engines, nec	1900 G	18	90	present	12
	Spent caustic	Metal coating and allied services	2386 G	DK	DK	DK	12
	Spent caustic	Metal coating and allied services, Bolts, nuts, rivets, and washers	31500 G	3	91	DK	12
	Spent caustic	Metal coating and allied services, Coating, engraving, and allied services	DK	DK	97	DK	11
	Spent caustic	Metal coating and allied services, Iron and steel forgings	27250 G	DK	DK	DK	12
	Spent caustic	Metal coating and allied services,Special industry machinery, nec	100 G	DK	DK	DK	12
	Spent caustic	Miscellaneous metal work	2 T	DK	99	DK	12
	Spent caustic	Miscellaneous metal work, Aircraft	910 T	15	85	N/A	12
	Spent caustic	Miscellaneous metal work, Aircraft	409 T	12	88	N/A	12
	Spent caustic	Motor vehicle parts and accessories	5200 G	0	80	0	12
	Spent caustic	Motors and generators	60 G	15	5	DK	12
	Spent caustic	National security	232 G	DK	DK	60	2
	Spent caustic	National security	42 T	17	80	0	10
	Spent caustic	National security, Plating and polishing,Metal coating and allied services	375 G	1	90	N/A	12
	Spent caustic	National security,Blueprinting and photocopying	28 G	DK	DK	DK	2
	Spent caustic	Organic fibers, noncellulosic, Plastics materials and resins	26 T	DK	DK	N/A	12
	Spent caustic	Petroleum refining	415 T	1	99	0	7
	Spent caustic	Petroleum refining	605640 G	2	98	DK	10
	Spent caustic	Petroleum refining	39753840 G	DK	DK	DK	12
	Spent caustic	Petroleum refining	30000 G	1	99	N/A	12
	Spent caustic	Plastics materials and resins	21888 T	N/A	85	N/A	12.5
	Spent caustic	Plating and polishing	365 T	5	80	5	12
	Spent caustic	Plating and polishing,Metal coating and allied services, Electronic components, nec	28 T	DK	99	DK	10
	Spent caustic	Radio and TV communication equipment	3840 G	2	50	0	10
	Spent caustic	Refuse systems	495 G	DK	70	N/A	12
	Spent caustic	Screw machine products	330 G	N/A	50	N/A	11
	Spent caustic	Secondary nonferrous metals	4000 G	DK	DK	DK	11
	Spent caustic	Ship building and repairing	660 G	1	65	DK	10
	Spent caustic	Ship building and repairing	1 T	DK	DK	DK	12
	Spent caustic	Steel investment foundries	1 T	DK	DK	DK	12
	Spent caustic	Steel investment foundries	10000 G	1	94	N/A	7
	Spent caustic	Steel wire and related products,Plating and polishing	10000 G	1	94	N/A	7
	Spent caustic	Synthetic rubber	20 T	80	20	0	12
	Spent caustic	Valves and pipe fittings	15 G	DK	50	DK	2
	Spent caustic		1000 G	12	80	0	12
Inorganic sludges	Air pollution control device sludge	Coating, engraving, and allied services	800 G	20	80	1	10
	Air pollution control device sludge	Industrial inorganic chemicals, nec	8190 T	N/A	70	N/A	4
Inorganic sludges	Chloride or other brine sludge	Fabricated metal products, nec	1045 G	10	90	DK	2
	Chloride or other brine sludge	Noncommercial research organizations	2 T	4	95	N/A	5.8
Inorganic sludges	Degreasing sludge with metal scale or filings	DK	24 T	90	9	3	12
Inorganic sludges	Lime sludge with metals/metal hydroxide sludge	Copper rolling and drawing	591 T	5	95	0	9
	Lime sludge with metals/metal hydroxide sludge	DK	2304 G	50	50	present	12
	Lime sludge with metals/metal hydroxide sludge	Metal coating and allied services	50 G	20	80	0	8
	Lime sludge with metals/metal hydroxide sludge	Metal coating and allied services	700 G	28	72	0	8
Inorganic sludges	Lime sludge without metals	Petroleum refining	1085 T	16	present	present	12
Inorganic sludges	Other wastewater treatment sludge	Cyclic crudes and intermediates	1 T	40	60	N/A	2
	Other wastewater treatment sludge	Manufacturing industries, nec	125 T	90	10	N/A	7
	Other wastewater treatment sludge	Paints and allied products,Plastics materials and resins	10 T	70	30	N/A	10
	Other wastewater treatment sludge	Refuse systems, Trucking, except local, Research and development laboratories	11 T	50	50	present	10
	Other wastewater treatment sludge	Services, nec	45571 G	75	25	DK	10
	Other wastewater treatment sludge	Trucking, except local	9500 G	38	50	9	12

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic sludges	Untreated plating sludge with cyanides	Alkalies and chlorine	1 T	20	80	0	2
Inorganic sludges	Untreated plating sludge without cyanides	Coating, engraving, and allied services, Metal coating and allied services, Screw machine products	6300 G	DK	DK	N/A	2
	Untreated plating sludge without cyanides	Instruments to measure electricity	2 T	DK	N/A	N/A	11
	Untreated plating sludge without cyanides	Motor vehicle parts and accessories, Automotive stampings, Automotive parts and supplies	3 T	73	27	DK	2
	Untreated plating sludge without cyanides	Plating and polishing	2T	70	20	70	2
	Untreated plating sludge without cyanides	Plating and polishing	50 G	95	present	present	2
	Untreated plating sludge without cyanides	Plating and polishing,Metal coating and allied services	1 T	60	40	DK	7
	Untreated plating sludge without cyanides	Tanks and tank components	5 T	98	2	DK	2
Inorganic sludges	Wastewater treatment sludge with toxic organics	Cyclic crudes and intermediates	1072 T	75	20	2	10
	Wastewater treatment sludge with toxic organics	Plating and polishing	576 G	20	present	DK	3
Inorganic solids	Ash, slag, or other residue from incineration	Refuse systems	35 T	99	0	0	12
Inorganic solids	Batteries or battery parts, casings, cores	DK	29 T	90	79	N/A	2
	Batteries or battery parts, casings, cores	Petroleum refining	3 T	present	present	N/A	2
	Batteries or battery parts, casings, cores	Railroads, line-haul operating,Switching and terminal devices	855 G	N/A	30	N/A	12
	Batteries or battery parts, casings, cores	Semiconductors and related devices, Electron tubes, receiving type, Electronic connectors	1 T	98	1	DK	2
Inorganic solids	Dry lime or metal hydroxide solids chemically "fixed"	Motor vehicles and car bodies	1050 G	98	0	present	10
	Dry lime or metal hydroxide solids chemically "fixed"	Transformers, Plating and polishing	1 T	100	0	0	12
	Dry lime or metal hydroxide solids chemically "fixed"	Vehicular lighting equipment	79 T	N/A	N/A	N/A	12
Inorganic solids	Dry lime or metal hydroxide solids not "fixed"	Ball and roller bearings	DK	DK	DK	DK	6
	Dry lime or metal hydroxide solids not "fixed"	National security	10 G	DK	DK	DK	12
Inorganic solids	Other "dry" ash, slag, or thermal residue	Alkalies and chlorine	48 G	99	1	DK	2
Inorganic solids	Other inorganic solids	Agricultural chemicals, nec	713 G	99	1	present	12
	Other inorganic solids	Aircraft	8 T	DK	DK	DK	2
	Other inorganic solids	Aircraft engines and engine parts	5800 G	99	1	DK	12
	Other inorganic solids	Aluminum sheet, plate, and foil, Aluminum rolling and drawing, nec	1 T	90	N/A	N/A	2
	Other inorganic solids	Chemical preparations, nec	440 G	90	40	N/A	12
	Other inorganic solids	DK	100122 G	100	N/A	N/A	8.5
	Other inorganic solids	Electronic components, nec	4 T	40	60	N/A	2
	Other inorganic solids	Electronic components, nec, Plating and polishing	15 T	99	present	present	8
	Other inorganic solids	Electronic computing equipment, Semiconductors and related devices	0	99	present	present	2
	Other inorganic solids	Electronic computing equipment, Semiconductors and related devices	0	99	N/A	N/A	12
	Other inorganic solids	Electronic computing equipment,Electronic components, nec	1 T	98	0	0	2
	Other inorganic solids	Electronic computing equipment,Electronic components, nec	1 T	96	0	N/A	2
	Other inorganic solids	Guided missiles and space vehicles, Space propulsion units and parts	1 T	98	1	N/A	3
	Other inorganic solids	Hardware, nec, Plating and polishing	55 G	90	10	DK	3
	Other inorganic solids	Hardware, nec, Plating and polishing	605 G	90	10	DK	12
	Other inorganic solids	Industrial gases	1 T	99	1	0	12
	Other inorganic solids	Industrial inorganic chemicals, nec	1 T	N/A	5	present	2
	Other inorganic solids	Industrial inorganic chemicals, nec	60 T	99	DK	DK	2
	Other inorganic solids	Industrial organic chemicals, nec	28 T	10	20	N/A	2
	Other inorganic solids	Industrial organic chemicals, nec	24 T	80	10	present	2
	Other inorganic solids	Instruments to measure electricity	1 T	30	present	DK	12
	Other inorganic solids	Metal coating and allied services	25 T	20	80	N/A	3.8
	Other inorganic solids	Motor vehicles and car bodies, Motor vehicle parts and accessories, Internal combustion engines, nec	3 T	92	N/A	DK	11
	Other inorganic solids	Noncurrent-carrying wiring devices	10 T	99	1	DK	12
	Other inorganic solids	Ordinance and accessories, nec	264 G	90	DK	N/A	6
	Other inorganic solids	Petroleum refining	108 T	100	0	DK	2
	Other inorganic solids	Petroleum refining	439 T	DK	DK	DK	2
	Other inorganic solids	Petroleum refining	86 T	84	16	8	3
	Other inorganic solids	Petroleum refining	2 T	92	6	DK	9
	Other inorganic solids	Petroleum refining, Industrial inorganic chemicals, nec	2 T	DK	DK	N/A	2
	Other inorganic solids	Plastics materials and resins, Industrial organic chemicals, nec	912 G	99	1	0	2
	Other inorganic solids	Pumps and pumping equipment	990 G	91	9	DK	12
	Other inorganic solids	Screw machine products	110 G	DK	DK	DK	11

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Inorganic solids (continued)	Other inorganic solids	Semiconductors and related devices	144 G	100	0	0	2
	Other inorganic solids	Semiconductors and related devices	24 T	99	0	0	2
	Other inorganic solids	Semiconductors and related devices	100 T	98	2	0	2
	Other inorganic solids	Semiconductors and related devices	1 T	N/A	50	N/A	3
	Other inorganic solids	Space research and technology	1 T	98	DK	DK	12
	Other inorganic solids	Tanks and tank components	2 T	98	2	DK	12
Inorganic solids	Other reactive salts/chemicals	Aluminum extruded products	25 T	85	15	0	12
	Other reactive salts/chemicals	Chemicals and allied products	1220 G	present	DK	DK	2
	Other reactive salts/chemicals	Construction machinery	1540 G	98	2	DK	4
	Other reactive salts/chemicals	Hardware, nec, Plating and polishing	770 G	95	5	DK	3
	Other reactive salts/chemicals	Industrial organic chemicals, nec	1 T	25	23	5	5
	Other reactive salts/chemicals	Iron and steel forgings, Metal coating and allied services	16875 G	95	5	DK	2
	Other reactive salts/chemicals	National security	14 T	100	0	DK	9
	Other reactive salts/chemicals	Plating and polishing	DK	60	40	N/A	2
	Other reactive salts/chemicals	Small arms, Plating and polishing	0	DK	95	DK	12
Inorganic solids	Other waste inorganic chemicals	Electronic components, nec	3 T	90	10	N/A	2
	Other waste inorganic chemicals	Electronic components, nec	5 G	DK	DK	DK	12.5
	Other waste inorganic chemicals	Electronic computing equipment	7 G	N/A	present	present	2
	Other waste inorganic chemicals	Electronic computing equipment	38 G	0	56	DK	2
	Other waste inorganic chemicals	Industrial inorganic chemicals, nec	102 T	99	1	N/A	2
	Other waste inorganic chemicals	Industrial inorganic chemicals, nec, Chemical preparations, nec	25 T	99	1	DK	12
	Other waste inorganic chemicals	Motor vehicles and car bodies	115 T	99	1	0	11
	Other waste inorganic chemicals	Petroleum refining	179 T	100	DK	DK	2.3
	Other waste inorganic chemicals	Screw machine products	0	DK	DK	DK	11
Inorganic solids	Solidified treatment residue	Commercial printing, letterpress,Food products machinery	150 G	0	40	0	3
Inorganic solids	Spent solid filters or adsorbents	Electric services	1 T	99	DK	DK	4
	Spent solid filters or adsorbents	Industrial organic chemicals, nec	9 T	70	20	8	2
	Spent solid filters or adsorbents	Industrial organic chemicals, nec	1 T	95	1	DK	2
	Spent solid filters or adsorbents	Industrial organic chemicals, nec	10 T	90	10	present	6
	Spent solid filters or adsorbents	Miscellaneous plastics products, Plating and polishing	288 G	20	80	DK	5
	Spent solid filters or adsorbents	Nonclassifiable establishment	129 T	75	25	1	2
	Spent solid filters or adsorbents	Organic fibers, noncellulosic	35 T	42	50	present	12
	Spent solid filters or adsorbents	Plating and polishing	16 T	48	DK	DK	7
	Spent solid filters or adsorbents	Services, nec	6336 G	95	2	DK	9
	Spent solid filters or adsorbents	Soap and other detergents	6 T	75	25	20	2
Lab packs	Concentrated off-spec or discarded product	Agricultural chemicals, nec	2 T	DK	5	DK	12
	Concentrated off-spec or discarded product	Chemicals and allied products	55 G	0	90	DK	2
	Concentrated off-spec or discarded product	Chemicals and allied products, Petroleum products, nec	2 T	99	1	N/A	2
	Concentrated off-spec or discarded product	Industrial controls	55 G	DK	70	N/A	2
	Concentrated off-spec or discarded product	Motor vehicles and car bodies	245 G	99	present	DK	12
	Concentrated off-spec or discarded product	National security	63 T	0	present	present	12
	Concentrated off-spec or discarded product	Plumbing, heating, air conditioning	53 G	25	50	DK	11
	Concentrated off-spec or discarded product	Semiconductors and related devices	275 G	0	65	0	2
	Concentrated off-spec or discarded product	Surface active agents	1 T	51	N/A	present	2
Lab packs	Empty or crushed metal drums or containers	Radio and TV communication equipment	168 T	99	N/A	N/A	2
Lab packs	Lab packs of old chemicals only	Electronic computing equipment,Electronic components, nec	1 T	95	DK	N/A	2
	Lab packs of old chemicals only	Industrial controls	1 T	DK	80	N/A	2
	Lab packs of old chemicals only	Medicinals and botanicals, Pharmaceutical preparations	2 T	0	90	13	5.5
	Lab packs of old chemicals only	Pens and mechanical pencils, Plating and polishing	120 G	99	0	DK	2
	Lab packs of old chemicals only	Pens and mechanical pencils, Plating and polishing	30 G	99	0	present	2
	Lab packs of old chemicals only	Radio and TV communication equipment	486 G	DK	DK	DK	2
	Lab packs of old chemicals only	Research and development laboratories	6 T	DK	DK	DK	3
	Lab packs of old chemicals only	Storage batteries	1 T	0	1	DK	2
Lab packs	Mixed lab packs	Cyclic crudes and intermediates	1 T	90	DK	10	2

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Lab packs (continued)	Mixed lab packs	Electronic computing equipment, Semiconductors and related devices	1045 G	99	N/A	N/A	2
Organic liquids	Concentrated aqueous solution of other organics	Chemicals and allied products	1790 G	5	10	DK	12
	Concentrated aqueous solution of other organics	General chemical manufacturing	2295 G	0	present	present	2
	Concentrated aqueous solution of other organics	General chemical manufacturing	38 T	15	85	DK	2
	Concentrated aqueous solution of other organics	General chemical manufacturing	182 T	2	96	2	2
	Concentrated aqueous solution of other organics	Industrial organic chemicals, nec	3000 G	DK	50	DK	2
	Concentrated aqueous solution of other organics	Instruments to measure electricity	1 T	5	15	DK	2
	Concentrated aqueous solution of other organics	Medicinals and botanicals	6810 T	45	55	DK	2.3
	Concentrated aqueous solution of other organics	National security	1 T	0	60	DK	2
	Concentrated aqueous solution of other organics	Pharmaceutical preparations	66 T	DK	DK	DK	2
	Concentrated aqueous solution of other organics	Semiconductors and related devices	2255 G	0	DK	DK	2
	Concentrated aqueous solution of other organics	Semiconductors and related devices	935 G	0	DK	DK	3
	Concentrated aqueous solution of other organics	Semiconductors and related devices	2475 G	0	DK	DK	11
	Concentrated aqueous solution of other organics	Telephone and telegraph apparatus, Semiconductors and related devices,Radio and TV communication eq	55 G	2	55	DK	12
Organic liquids	Concentrated phenolics	Industrial organic chemicals, nec	81999 G	N/A	0	DK	11
	Concentrated phenolics	Petroleum refining	519022 G	2	98	DK	8
Organic liquids	Concentrated solvent-water solution	Photographic equipment and supplies	20000 G	13	78	10	2
Organic liquids	Halogenated (e.g., chlorinated)solvent	Truck and bus bodies	2 T	1	DK	DK	5
Organic liquids	Halogenated/nonhalogenated solvent mixture	Coating, engraving, and allied services, Refrigeration and heating equipment	110 G	7	DK	DK	3
	Halogenated/nonhalogenated solvent mixture	Electronic resistors	3 T	DK	1	DK	2
	Halogenated/nonhalogenated solvent mixture	Engineering and scientific instruments, Surgical and medical instruments	591 G	DK	DK	DK	2
	Halogenated/nonhalogenated solvent mixture	Space propulsion units and parts	110 G	1	10	95	3
Organic liquids	Nonhalogenated solvent	Cyclic crudes and intermediates	2 T	10	25	60	12
Organic liquids	Oil-water emulsion or mixture	Petroleum refining	1493 T	DK	25	DK	2
Organic liquids	Organic paint, ink, lacquer, or varnish	Pens and mechanical pencils	787 G	0	95	present	3
	Organic paint, ink, lacquer, or varnish	Pens and mechanical pencils	317 G	50	45	present	3
Organic liquids	Other organic liquid	Agricultural chemicals, nec	3 T	present	present	present	2
	Other organic liquid	Chemical preparations, nec	25900 G	5	98	5	3
	Other organic liquid	DK	0	0	20	DK	12
	Other organic liquid	Electronic components, nec	1152 G	20	75	DK	2
	Other organic liquid	Electronic components, nec	4342 G	0	70	N/A	2
	Other organic liquid	General chemical manufacturing, Industrial organic chemicals, nec	43127 T	DK	DK	DK	2
	Other organic liquid	Industrial organic chemicals, nec	10045537 T	1	99	1	8
	Other organic liquid	Metal coating and allied services	65365 G	4	95	DK	3.4
	Other organic liquid	Metal coating and allied services	116 T	99	DK	DK	11
	Other organic liquid	Organic fibers, noncellulosic	DK	DK	DK	DK	2
	Other organic liquid	Organic fibers, noncellulosic, Plastics materials and resins	2 T	N/A	5	DK	2
	Other organic liquid	Paper mills, except building paper	390 G	10	90	DK	2
	Other organic liquid	Petroleum refining	190 T	N/A	1	DK	2
	Other organic liquid	Plastics materials and resins	485 T	0	5	1	2
	Other organic liquid	Plastics materials and resins	1 T	5	90	DK	10
	Other organic liquid	Plastics materials and resins, Industrial organic chemicals, nec	1815	DK	1	N/A	5
	Other organic liquid	Semiconductors and related devices	2800 G	1.5	5	DK	12
Organic liquids	Paint thinner or petroleum distillates	Cathode ray television picture tubes	46 G	10	DK	DK	4
Organic liquids	Spent solvent	Metal coating and allied services	9000 G	N/A	99	N/A	6.5
	Spent solvent	Paper coating and glazing	6 T	4	58	30	12
Organic liquids	waste oil	Ordinance and accessories, nec, Screw machine products	4070 G	present	70	present	2
Organic sludges	Adhesives or expoxies	DK	1 T	DK	DK	DK	7

TABLE B-1 CHACTERIZATION DATA FOR CHARACTERISTIC CORROSIVE WASTES D002

PHYSICAL WASTE DESCRIPTION	WASTE DESCRIPTION	INDUSTRIAL DESCRIPTION	QUANTITY	SOLIDS (%)	WATER (%)	ORGANIC CONTENT (%)	PH
Organic sludges	Oily sludge	Petroleum refining	3 T	DK	10	present	8
	Oily sludge	Space research and technology	5 T	50	40	DK	11
Organic sludges	Organic paint or ink sludge	Cyclic crudes and intermediates	3 T	56	30	20	2
Organic sludges	Other organic sludge	General chemical manufacturing	21 T	45	52	1	3
	Other organic sludge	Industrial organic chemicals, nec	5 T	80	20	80	2
	Other organic sludge	Industrial organic chemicals, nec	1 T	50	5	95	2
	Other organic sludge	Plastics materials and resins	16985 G	2	48	DK	10
	Other organic sludge	Plating and polishing	200 G	90	2	DK	8
Organic sludges	Reactive or polymerizable organics	Toilet preparations	312 G	26	5	1	2
Organic sludges	Resins, tars or tarry sludge	Petroleum refining	14 T	85	DK	DK	5
Organic sludges	Still bottoms of nonhalogenated organic liquids	Industrial organic chemicals, nec	64 T	60	30	64	2
	Still bottoms of nonhalogenated organic liquids	Petroleum refining	14700 G	9	59	0.4	8
Organic solids	Nonhalogenated pesticide solid	Agricultural chemicals, nec	10 T	99	0	15	10
Organic solids	Other halogenated organic solid	Chemical preparations, nec	100 T	DK	DK	DK	2
	Other halogenated organic solid	Industrial organic chemicals, nec	184 T	100	5	N/A	2
	Other halogenated organic solid	Synthetic rubber, Industrial organic chemicals, nec	163 T	50	50	7	10
Organic solids	Other nonhalogenated organic solid	Aircraft	8814 G	99	DK	DK	2
	Other nonhalogenated organic solid	Ammunition, except for small arms, nec	96 G	99	0	0	4
	Other nonhalogenated organic solid	Chemicals and allied products	1010 G	80	0	DK	12
	Other nonhalogenated organic solid	General chemical manufacturing,Surface active agents	9 T	80	15	present	10
	Other nonhalogenated organic solid	Industrial organic chemicals, nec	4 T	60	1	present	2
	Other nonhalogenated organic solid	Industrial organic chemicals, nec	123 T	92	8	31	2.7
	Other nonhalogenated organic solid	Motor vehicles and car bodies	55 G	37	N/A	DK	2
	Other nonhalogenated organic solid	Sausages and other prepared meats	284 T	6	94	present	2
	Other nonhalogenated organic solid	Valves and pipe fittings	550 G	94	6	0	7
Organic solids	Reactive organic solid	DK	8 T	53	0	DK	2
	Reactive organic solid	Industrial inorganic chemicals, nec	0 T	91	9	86	10
Organic solids	Solid resins or polymerized organics	Cyclic crudes and intermediates	8 T	99	1	6	7
	Solid resins or polymerized organics	Industrial organic chemicals, nec	3685 G	85	N/A	N/A	12
Organic solids	Spent carbon	Cyclic crudes and intermediates,Industrial organic chemicals, nec	2 T	50	50	present	2
	Spent carbon	Cyclic crudes and intermediates,Industrial organic chemicals, nec	17 T	50	50	present	2
	Spent carbon	Industrial organic chemicals, nec	15 T	66	0	DK	2
Organic solids	Spent carbon	Organic pesticide products	880 G	90	10	N/A	2.7
	Spent carbon	Pharmaceutical preparations	4 T	90	10	DK	2

DK=Don't know
G=Gallons
T=Tons
N/A=Not available

Reference: USEPA 1988e

Table B-2 Corrosive Waste Quantity Handled by Industrial Classification (million gallons/year)

SIC code	Industry description	Waste quantity handled[a]		
		High	Low	Percent
28	Chemicals and allied products	18,3373	15,590	71.5
49	Electric, gas, and sanitary services	2,305	1,960	9.0
29	Petroleum refining	1,150	978	4.5
33	Primary metals	1,143	972	4.5
26	Paper and allied products	1,126	957	4.4
36	Electric and electronic machinery, equipment, and supplies	581	495	2.3
35	Machinery, except electrical	417	354	1.6
32	Stone, clay, glass, concrete	190	162	0.7
34	Fabricated metals	183	156	0.7
37	Transportation equipment	136	115	0.5
20	Food and kindred products	27	23	0.1
--	Other industries	50	42	0.2
	Total:	25,645	21,803	100.0

[a] Includes D002 and K062 only.

Source: USEPA. 1988c.

APPENDIX C

WASTE CHARACTERIZATION AND INDUSTRIAL DESCRIPTIONS FOR D003 WASTES

Table C-1 Characterization and Industry Data for D003 Wastes That Are Only Characteristic Reactive Wastes (i.e., not mixed with other hazardous wastes) According to the 1986 TSDR Survey for Non-CBI Facilities Only

SIC code	Industry description	Waste description	Amount generated in tons	Management practice in 1986
2911	Petroleum refining	Oily sludge	13,461	Land treatment
		Soil contaminated with inorganics	44	Land treatment
		Sludge with reactive sulfides	13	Land treatment
		Aqueous waste with reactive sulfides	45,150	Underground injection
		Aqueous waste with reactive sulfides	2,983,333	Underground injection
		Aqueous waste with reactive sulfides	1,216,667	Underground injection
		Aqueous waste with reactive sulfides	1,212,500	Underground injection
		Sludge with other reactives	77	Landfill
		Reactive sulfide salts/chemicals	3,701	Waste piles
2811	Other chemicals and allied industries	Reactive organic solid	1	Landfill
9511	Industrial organic chemicals, nec	Other waste inorganic chemicals	1	Landfill
2800	Industrial organic chemicals, nec	Nonhalogenated solvent	7	Surface impoundment
2800	Chemicals and chemical preparations, nec	Reactive sulfide salts/chemicals	1	Landfill
2822		Nonhalogenated solvent	825,312	Surface impoundment
2869	Industrial organic chemicals, nec	Reactive organic solid	36	Surface impoundment
		Reactive or polymerizable organic liquid	120,833	Underground injection
2892	Explosives (TNT production, lead azide, etc.)	Aqueous waste with other reactives (e.g., explosives)	4	Surface impoundment
3644	Electroplating, plating, polishing, anodizing, and coloring	Other inorganic liquid	4,610	Surface impoundment
9711	National security	Reactive sulfide salts/chemicals	1	Surface impoundment
9711	Research and development laboratories	Other reactive salts/chemicals	1	surface impoundment
3312	Blast furnaces (including coke ovens), steel works, and rolling mills	Caustic with solution cyanides but no metals	45,833	Underground injection
2892	Explosives	Other inorganic solids	1	Waste piles
		Aqueous waste with other reactives (e.g., explosives)	15	Surface impoundment
		Other reactive salts/chemicals	52	Surface impoundment
3321	Gray iron foundries	Other "dry" ash, slag, or thermal residue	7,271	Waste piles
		Other "dry" ash, slag, or thermal residue	2,827	Waste piles
		Other "dry" ash, slag, or thermal residue	2,320	Waste piles

Reference: USEPA 1986.

Table C-2 Characterization and Industry Data for Mixed Wastes Containing Reactive Wastes According to the 1986 TSDR Survey for Non-CBI Facilities Only

SIC code	Industry description	Waste code	Waste description	Amount generated in tons	Management practice in 1986
2911	Petroleum refining	D001 D003 D007 D008	Oily sludge	11	Land treatment
		D001 D003	Oily sludge	538	Land treatment
		D001 D002 D003	Reactive sulfide salts/chemicals	7	Land treatment
		D002 D003	Metal scale, filings, or scrap	2	Land treatment
		D001 D002 D003	Concentrated aqueous solution of other organic	239	Surface impoundment
		D002 D003	Spent caustic	1,749	Surface impoundment
		D003 D002	Spent caustic	4,878	Surface impoundment

Table C-2 (continued)

SIC code	Waste description	Waste code	Industry description	Amount generated in tons	Management practice in 1986
2911	Petroluem refining (cont.)	D002 D003	Aqueous waste with other reactives (e.g., explosives)	3,000	Surface impoundment
		D002 D003	Caustic aqueous waste Aqueous waste with reactive sulfides	668,685	Underground injection
2860	Colleges, universities, professional schools, and junior colleges	D001 D002 D003 U075 U151	Lab packs of old chemicals only	5	Landfill
2800	General chemical manufacturing	D001 D009 D003	Lab packs of debris only	1	Landfill
		D003 D006 D011	Lab packs of old chemicals only	1	Landfill
		D001 D002 D003 F003	Reactive or polymerizable organic liquid Nonhalogenated solvent	899	Surface impoundment
		D001 D002 D003	Nonhalogenated solvent Reactive or polymerizable organic liquid	37	Surface impoundment

Table C-2 (continued)

SIC code	Waste description	Waste code	Industry description	Amount generated in tons	Management practice in 1986
2869	Industrial organic chemicals, nec	D002 D003	Reactive or polymerizable organic liquid	182,385	Surface impoundment
		D001 D002 D003	Reactive or polymerizable organic liquid	65,753	Surface impoundment
		D001 D003	Reactive or polymerizable organic liquid	19	Surface impoundment
		D001 D002 D003 D007	Aqueous waste with low solvents Acidic aqueous waste Aqueous waste with reactive sulfides Other inorganic liquid	40,725	Surface impoundment
		D002 D003	Spent caustic Aqueous waste with reactive sulfides	75,000	Underground injection
		D002 D003	Acidic aqueous waste Aqueous waste with other reactives (e.g., explosives)	810,608	Underground injection
		D003 D004 D005 D007	Other waste inorganic chemicals	383	Landfill

Table C-2 (continued)

SIC code	Waste description	Waste code	Industry description	Amount generated in tons	Management practice in 1986
2816	Inorganic pigments	D002	Soil contaminated with organics	20	Landfill
		D003			
9711	National security	D001	Nonhalogenated solvent	1	Landfill
		F003			
		F005			
1321	Oil and gas extraction	D001	Spent solid filters or absorbents	61	Landfill
		D003			
2821	Plastics materials, synthetic resins, and non-volcanizable elastomers	D001	Acidic aqueous waste	1,352	Surface impoundment
		D002	Other reactive sales/chemicals		
		D003			
2833	Medicinal chemicals and botanical products	D001	Concentrated solvent-water solution	2,458,353	Surface impoundment
		D002	Acidic aqueous waste		
		D002	Caustic aqueous waste		
		D003	Caustic solution with cyanides but no metals		
		F002	Aqueous waste with low solvents		
		F003	Aqueous waste with low solvents		
		P106	Caustic solution with cyanides but no metals		
		U080	Halogenated (e.g., chlorinated) solvent		
		U112	Nonhalogenated solvent		
		U154	Nonhalogenated solvent		
		U220	Nonhalogenated solvent		

Table C-2 (continued)

SIC code	Waste description	Waste code	Industry description	Amount generated in tons	Management practice in 1986
2833	Medicinal chemicals and botanicals	D003	Caustic solution with cyanides but no metals	27,090	Surface impoundment
		P106	Caustic solution with cyanides but no metals		
2879	Alkalies and chlorine	D002	Acidic aqueous waste	179,036	Surface impoundment
		D003	Aqueous waste with other reactives (e.g., explosives)		
3482	Small arms ammunition explosives (TNT production, lead azide, etc.)	D002 D003 K044 K046	Aqueous waste with other reactives (e.g., explosives)	1,750	Surface impoundment

Reference: USEPA 1986.

TABLE C-3 CHARACTERIZATION DATA FOR D003 REACTIVE CYANIDE SUBCATEGORY

WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	INDUSTRIAL DESCRIPTION	SOLIDS (%)	WATER (%)	CYANIDE (PPM)	CONSTITUENTS PRESENT IN PERCENTAGE LEVELS
Aqueous waste with other reactives	Other process	National security	0	90	170	N
	Pickling	Ship building and repairing	DK	DK	DK	N
Caustic solution with cyanides but no metals	Other clean out or closure process	Bolts, nuts, rivets, and washers,plating and polishing	40	5	250	N
	Other one-time process	Research and development laboratories	DK	90	15000	Xylene(0.1-1%)
	Electroplating	Electronic components, nec	DK	DK	1000	N
	Reaction/synthesis media processing	Cyclic crudes and intermediates,indust. organic chemicals,nec	35	65	2000	Cyanides(0.1-1%)
Caustic solution with metals and cyanides	Other poll. control or waste treatment process	Special warehousing and storage, nec	10(5*)	85	20000	N
	Stripping	Semiconductors and related devices	24	P	P	N
	Electroplating	Electron tubes, transmitting	P	99	44	N
	Electroplating	Current-carrying wiring dev.,semicon. and rel. dev., elect. comp. nec	1	98	1	N
	Electroplating	Farm machinery and equipment	1	99	100	N
	Dip rinsing	Noncurrent-carrying wiring devices	9	80	100	Cd(0.1-1%)
	Electroplating	Electronic computing equipment	P	95	1000	Cyanides(0.1-1%)
	Laboratory wastes	Steel pipe and tubes	DK	DK	3100	Cyanides(0.1-1%)
	Surface coating	Plating and polishing	39	62	6854	Zinc cyanide(1-10%), Cu(0.1-1%), Zn(25-50%)
	Electroplating	Speed changers, drives and gears,aircraft equip., nec	DK	90	9800	Copper cyanide(25-50%),Cu(0.1-1%)
	Electroplating	Nonferrous rolling and drawing, nec	NA	NA	DK	Cyanides(10-25%)
Concentrated off-spec or discarded product	Discarding of off-spec material	Misc. plastics products	DK	0	5	N
Lab packs of old chemicals only	Laboratory wastes	Colleges and universities, nec	83	0	5	N
Metal-cyanide salts/chemicals	Electroplating	Plating and polishing	99	1	1000	Copper cyanide(1-10%), Cu(1-10%)
	Other waste production process	Ship building and repairing	DK	DK	DK	N
	Discarding of off-spec material	National security, gen. automotive repair shops	2	93	P	N
	Discarding of out-of-date products or chemicals	Industrial controls	85	15	P	N
Other inorganic liquid	Surface coating	Semicond. and rel. devices, plating and polishing	0	99	1	N
	Dip rinsing	Electron tubes, transmitting,x-ray apparatus and tubes	2	98	1	N
	Electroplating	Electronic components, nec	DK	99	1	N
	Other poll. control or waste treatment process	Organic fibers, noncellulosic	(2*)	95	10	N
	Electroplating	Plating and polishing	Nd	DK	55	N
	Other process	Primary aluminum	DK	99	580	N
	Pyrolysis	Blast furnaces and steel mills	1	98	720	N
	Wastewater treatment	Industrial inorganic chemicals, nec	5(0*)	95	50000	N
Other inorganic solids	Dewatering	Organic fibers, noncellulosic	98	1	20	Cu(500ppm-0.1%),Ni(25-50%)
	Accidental spills & discharges	Organic fibers, noncellulosic	99	NA	50	N
	Closure of process equipment	Semiconductors and related devices	99	NA	1000	Cyanides(1-10%)
Other organic liquid	Discarding of off-spec material	Soap and other detergents	5	50	1	N
Other organic sludge	Filtration/centrifuging	Organic fibers, noncellulosic	25	70	10	Ni(25-50%)
Other reactive salts/chemicals	Other process	Fabricated metal products, nec,aircraft engines and engine parts	95	4	0	N
	Other waste production process	DK	75	25	0	N
	Other waste production process	Indust. organic chemicals, nec,cyclic crudes and intermeds.,synth. rubber	75	25	0	N
	By-product processing	Primary nonferrous metals, nec	100	0	1.7	N
	Surface coating	Aircraft engines and engine parts	95	DK	DK	N
	Laboratory wastes	Junior colleges	DK	DK	DK	N
	Discarding of off-spuc material	Industrial organic chemicals, nec	99	DK	DK	N
	Other process	Biological products	DK	DK	DK	N
	Molding/forming	Industrial inorganic chemicals, nec	99	0	DK	N
Other sludge with cyanides	Other poll. control or waste treatment process	Organic fibers, noncellulosic	30(10*)	55	10	Ni(0.1-1%)
	Filtering/screening	Organic fibers, noncellulosic	25(5*)	65	10	Ni(0.1-1%)
Other untreated waste	Electroplating	Small arms,plating and polishing	100	NA	3.3	N
Reactive cyanide salts/chemicals	Discarding of out-of-date products or chemicals	Research and development labs	99	DK	0	Sodium cyanide(10-25%),potassium cyanide(50-75%)
	Other waste production process	Aircraft	73	DK	0	N
	Clean out of process equipment	Motor vehicle parts and accessories	100	NA	24700	Benzene(500ppm-0.1%)
	Electroplating	Plating and polishing,metal coating and allied servs.,ordnance and access. ,nec	100	0	100000	Copper cyanide(10-25%), Cd(1-10%),Cu(1-10%)
	Cleanout of process equipment	Small arms ammunition	100	0	230000	N
	Discarding of out-of-date products or chemicals	Plating and polishing	70	30	700000	Cyanides(50-75%),Ag(50-75%)
	By-product processing	Semiconductors and related devices	NA	NA	DK	N
	Nitration	Metal heat treating	99	0	39903	Sodium cyanide(1-10%)
Reactive or polymerizable organics	Other poll. control or waste treatment proc.	Refuse systems	5	80	170	Toluene(1-10%)
Reactive organic solid	Laboratory wastes	Semiconductors and related devices	100	0	0	N
	Discarding of off-spec material	Semiconductors and related devices	85	15	0	N
	Dewatering	Organic fibers, noncellulosic	98	1	20	N

TABLE C-3 CHARACTERIZATION DATA FOR D003 REACTIVE CYANIDE SUBCATEGORY

WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	INDUSTRIAL DESCRIPTION	SOLIDS (%)	WATER (%)	CYANIDE (PPM)	CONSTITUENTS PRESENT IN PERCENTAGE LEVELS
	Filtration/centrifuging	Industrial organic chemicals, nec	DK	DK	500	N
	Other pollution control or waste treatment process	Electronic components, nec	30	70	700	Cyanides(500ppm-0.1%)
Soil contaminated with inorganics only	Cleanup of spill residue	Organic fibers, noncellulosic	98	2	10	Ni(0.1-1%)
	Cleanup of spill residue	Organic fibers, noncellulosic	95	2	10	Sb(500ppm-0.1%),As(0.1-1%),Ba(500ppm-0.1%)
Spent solid filters/adsorbents	Filtration/centrifuging	Organic fibers, noncellulosic	96	NA	10	Ni(500ppm-0.1%)
	Filtration/centrifuging	Organic fibers, noncellulosic	99	1	10	N
	Filtration/centrifuging	Organic fibers, noncellulosic	90	10	10	Ni(500ppm-0.1%)
	Filtration/centrifuging	Organic fibers, noncellulosic	99	NA	10	N
	Electruplating	Semiconductors and related dev.,electron tubes, rec. type, elec. connectors	99	1	2000	N
Wastewater or aqueous mixture	Electroplating	Steel wire and related products	(15*)	85	20000	N
	Electroplating	Steel wire and related products	(15*)	85	20000	Zn(0.1-1%)
	Electroplating	Steel wire and related products	15	85	20000	Sodium cyanide(0.1-1%),copper cyanide(0.1-1%),Zinc cyanide(0.1-1%)
	Electroplating	Steel wire and related products	15	85	20000	Sodium cyanide(0.1-1%),copper cyanide(0.1-1%),zinc cyanide(0.1-1%)

* = SUSPENDED SOLIDS
DK = DON'T KNOW
N = NONE LISTED
NA = NOT AVAILABLE
P = PRESENT

REFERENCE: USEPA 1988e

Table C-4 Waste Characterization for D003 Explosives Subcategory

Type of waste	Constituents	General or typical concentration or amount	Comments
PEP	Nitroguanidine	50%	D003
	Nitroglycerin	20%	D003
	Nitrocellulose	20%	D003
	Ethyl Centralite	Trace	D003
	TNT	Trace	D003
	DNT	Trace	D003
	Aluminum Powder	Trace	D003
Waste Propellant	Nitrocellulose	75-80%	D003
	Nitroglycerin	17-22%	D003
	Ethyl Centralite	Trace	D003
Off-Spec TNT	2,4,6-TNT	90-98%	D003
	Various isomers of TNT	Trace	D003
	Isomers of DNT	Trace	D003
	Other various compounds	Trace	D003

Reference: Department of the Army, 1984.

TABLE C-5 CHARACTERIZATION DATA FOR D003 EXPLOSIVES SUBCATEGORY

WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	INDUSTRIAL DESCRIPTION	PERCENT SOLIDS	PERCENT WATER	OTHER CONSTITUENTS
Aqueous waste w/other react.(eg.exp)	Other waste production process	Surgical appliances and supplies	P	P	N
Concentrated off-spec or discarded product	Clean out of process equipment	Ammunition, except for small arms, nec	90	10	N
	Disc. of off-spec material	Explosives	P	P	Nitroglycerin(1-10%),acetone(0.1-1%),xylene(500ppm-0.1%),Pb(1-10%)
	Discarding of off-spec material	Ammunition, exc. for small arms, nec,ordnance and accessories, nec	99	1	Trinitrotoluene(50-75%)
Lab packs of debris only	Discarding of off-spec material	Ammunition, except for small arms, nec	P	NA	N
Other inorganic solids	Other process	Ammunition, exc. for small arms	99	NA	N
	Other process	Ammunition except for small arms, nec,ordnance and accessories	99	1	N
	Other process	Chemical prep., nec,ammunition except for small arms, nec,ordnance	99	1	N
	Discarding of off-spec material	Explosives	84	16	Thiourea(0.1-1%)
	Other waste production process	Explosives	99	1	N
	Other waste production process	Explosives	DK	DK	N
	Other waste production process	Explosives	95	DK	N
	Other waste production process	Explosives	95	DK	N
	Other process	Explosives	4	96	Sb(500ppm-0.1%),Ba(0.1-1%),Pb(0.1-1%)
	Discarding of out-of date chemicals	Gen. government, nec, national security	P	NP	N
	Other process	Small arms ammunition	99	NA	Nitroglycerin(1-10%),dibutylphthalate(0.1-1%),2,4-dinitrotoluene(0.1-1%)
	Other process	Small arms ammunition	99	NA	Sb(500ppm-0.1%),Ba(0.1-1%),Pb(0.1-1%)
	Other process	Small arms ammunition	99	NA	Sb(500ppm-0.1%),Ba(0.1-1%),Pb(0.1-1%)
	Other process	Small arms ammunition,ordnance and accessories, nec	99	DK	N
Other nonhalogenated organic solid	Clean out of process equipment	Explosives	99	NA	Nitroglycerin(25-50%)
	Other waste production process	National security,ammunition except for small arms, nec	NA	0	N
	Materials handling	Small arms ammunition	99	0	Nitroglycerin(10-25%)
	Other process	Small arms ammunition	33	67	N
Other organic liquid	Solvent extraction	Explosives	0	2	2,4-dinotrotoluene(50-75%), dibutylphthalate(10-25%), diphenylamine(1-10%),ethyl acetate(0.1-1%)
	Solvent extraction	Explosives	0	1	Dibutylphthalate(10-25%),nitroglycerin(10-25%),diphenylamine(1-10%),ethyl acetate(1-10%)
Other organic sludge	Other cleaning/degreasing process	Ordnance and accessories, nec	NA	NA	N
	Tank bottoms removal	Ammunition, except for small arms, nec	80	20	N
	Clean out of process equipment	Explosives,nitrogenous fertilizers, fertilizers, mixing only	90	10	Nitroglycerin(0.1-1%)
Other reactive salts/chemicals	Other waste production process	Ammunition, exc. for small arms,nec,iron and steel forgings	NA	NA	N
	Discarding of off-spec material	Ammunition, except for small arms, nec,chemical preparations, nec	80	20	N
	Materials handling	Explosives	98	0	Ba(1-10%),Cu(1-10%), Pb(1-10%), Se(1-10%)
Reactive or polymerizable organic liquid	Other waste production process	Guided missiles and space vehicles,space propulsion units and parts	DK	0	N
	Other waste production process	Guided missiles and space vehicles,space propulsion units and parts	DK	DK	N
Reactive organic solid	Discarding of out-of-date or chemicals	Ammunition except for small arms,small arms ammunition,	100	0	N
	Materials handling	Ammunition, exc. for small arms,nec,ordnance and access	90	10	Trinitrotoluene(50-75%),nitroglycerin(10-25%),diphenylamine(0.1-1%)
	Other waste production process	Ammunition, except for small arms, nec	99	0	Diphenylamine(0.1-1%)
	Other waste production process	Ammunition, except for small arms, nec,small arms ammunition	P	P	N
	Discarding of off-spec material	Explosives	85	15	N
	Discarding of off-spec material	Explosives	P	P	N
	Cleanup of spill residues	Explosives	99	NA	N
	Discarding of contaminated cleanup equipment	Explosives	20	0	N
	Clean out of process equipment	Explosives	99	1	Trinitrotoluene(25-50%)
	Other process	Explosives	100	ND	N
	Discarding of off-spec material	Explosives	95	5	N
	Other process	Guided missiles and space vehicles	100	0	N
	Other waste production process	Guided missiles and space vehicles	NA	NA	N
	Other waste production process	National security, explosives	99	0	N
	By-product processing	Space propulsion units and parts	90	0	N

DK= DON'T KNOW
N=NONE
NA=NOT AVAILABLE
P=PRESENT

REFERENCE : USEPA 1988e

TABLE C-6 CHARACTERIZATION DATA FOR D003 WATER REACTIVES SUBCATEGORY

WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	INDUSTRIAL DESCRIPTION	PERCENT SOLIDS	PERCENT WATER
Batteries or battery parts,casings or cores	Other process	Motor vehicle parts and access.,automotive stampings	100	NA
	Other process	National security	NA	NA
	Disc. of out-of-date products/chemicals	National security	DK	DK
	DK	National security	P	NA
	Other one-time process	National security	99	DK
	Other process	National security	NA	NA
	Other process	National security	DK	0
	Discarding of out-of-date products or chemicals	National security	99	DK
	Discarding of off-spec material	National security, communication services, nec	100	ND
	Discarding of off-spec material	National security, communication services, nec	100	ND
	Size reduction	Primary batteries, dry and wet	NA	NA
	Discarding of off-spec material	Primary batteries, dry and wet	NA	NA
	Other process	Primary batteries, dry and wet	99	NA
	Discarding of off-spec material	Primary batteries, dry and wet	NA	NA
	Other waste production process	Radio and tv communication equipment	99	NA
	Electrostatic precipitation	Regulation, administration of transportation	90	10
Metal scale, filings or scrap	Laboratory wastes	DK	99	DK
	Size reduction	Primary batteries, dry and wet	NA	NA
	Size reduction	Primary batteries, dry and wet	NA	NA
	Size reduction	Primary batteries, dry and wet	NA	NA
	Size reduction	Research and development laboratories	100	0
Other "dry" ash,slag or thermal residue	Slag removal	Gray iron foundries	100	0
	Slag removal	Gray iron foundries	100	DK
	Slag removal	Primary metal products, nec	100	0
	Slag removal	Industrial inorganic chemicals, nec	99	0
	Slag removal	Industrial inorganic chemicals, nec	99	0
Other metal salts/chemicals	High temperature metal refining	Primary nonferrous metals, nec	100	0
Other treatment residue	Other process	Gray iron foundries	95	5
Reactive organic solid	Discarding of out-of-date products or chemicals	Primary batteries, dry and wet	NA	NA

DK = DON'T KNOW
NA = NOT AVAILABLE

REFERENCE : USEPA 1988e

TABLE C-7 CHARACTERIZATION DATA FOR D003 REACTIVE SULFIDE SUBCATEGORY

WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	INDUSTRIAL DESCRIPTION	SOLIDS (%)	WATER (%)	SULFIDE (PPM)	CONSTITUENTS PRESENT IN PERCENTAGE LEVELS
Acidic aqueous waste	Electroplating	Commercial printing, gravure	2	98	100	N
Aqueous waste with reactive sulfides	Decantation/sedimentation	Petroleum refining	DK	99	43000	H2S(0.1-1%)
	Air & steam stripping	Industrial inorganic chemicals, nec	10	80	10000	N
	Distillation & fractionation	Petroleum refining	(1*)	99	7180	N
	Inorganic aqueous reactions	Leather tanning and finishing	5(1*)	95	4000	N
	Distillation & fractionation	Petroleum refining	2	98	2500	N
	Flue gas desulfurization	Petroleum refining	10	85	1270	N
	Closure of process equipment	Industrial inorganic chemicals, nec	0	90	3	N
	Clean out of process equipment	Industrial organic chemicals, nec	5	95	NA	Carbon disulfide(0.1-1%)
	Reaction/synthesis media processing	Industrial organic chemicals, nec	1	99	10000	H2S(0.1-1%)
	Other one-time process	Industrial organic chemicals, nec	10	90	6000	N
	Other waste production process	Petroleum refining	0.4	99	3975	Phenol(500ppm-1%)
	Solvent extraction	Petroleum refining	12	88	500	H2S(500ppm-0.1%)
	Other process	Electronic computing equipment	DK	DK	10	N
	Reaction/synthesis media processing	Industrial organic chemicals, nec	DK	DK	2	N
Caustic aqueous waste	Clean out of process equipment	Petroleum refining	P	98	1270	N
Lab packs of old chemicals only	Laboratory wastes	Research and development laboratories	10	1	200	Ethyl ether(25-50%), Ethylene glycol monoethyl ether(10-25%), Ethyl methacrylate(10-25%)
Metal scale, filings or scrap	Clean out of process equipment	Industrial organic chemicals, nec	99	1	31	N
Mixed lab packs	Discarding of out of date products or chemicals	Cyclic crudes and intermediates	90	DK	10000	Cr(total)(0.1-1%), Cr(hexav)(0.1-1%)
Other inorganic liquid	Laboratory wastes	Colleges and universities, nec,gen. medical and surgical hospitals	P	99	1000	Cyanides(500ppm-0.1%)
	Other waste production process	Blast furnaces and steel mills	P	99	220	Cyanides(500ppm-0.1%)
	Pyrolysis	Blast furnaces and steel mills	1	99	120	N
	Other process	Primary aluminum	DK	99	113	N
Other inorganic solids	Cleanout of process equipment	Petroleum refining	60	40	600000	N
	Filtration/centrifuging	Cyclic crudes and intermediates	50	50	46000	N
	Other waste production process	Petroleum refining	99	0	1000	Ni(1-10%),V(10-25%)
	Degreasing sludge with metal scale or filings	Crude petroleum and natural gas, natural gas liquids	100	DK	250	N
	Distillation and fractionation	Crude petroleum and natural gas, natural gas liquids	2	98	100	N
Other nonhalogenated organic solid	Other waste production process	Plastics materials and resins,industrial organic chemicals, nec	50	1	5	N
Other organic liquid	Flue gas desulfurization	Industrial inorganic chemicals, nec	0	80	1000	H2S(500ppm-0.1%)
	Distillation and fractionation	Industrial organic chemicals, nec	1	85	70	N
Other organic sludge	Other clean out or closure process	Cyclic crudes and intermediates	75	25	200	Naphthoquinone(25-50%), Pyridine(1-10%)
Other reactive salts/chemicals	Slag removal	Gray iron foundries	3	0	250	N
Reactive or polymerizable organic liquid	By-product processing	Miscellaneous plastics products	0	20	74	Phthalic acid esters(75-90%)
Reactive organic solid	Other clean out or closure process	Petroleum and coal products, nec	80	20	268000	Cyanides(0.1-1%)
	Gas adsorption	Crude petroleum and natural gas	DK	DK	2.2	N
Reactive sulfide salts/chemicals	Other one-time process	Petroleum refining	90	0	P	Ni(500ppm-0.1%)
	Filtration/centrifuging	Industrial organic chemicals, nec	90	10	NA	H2S(500ppm-0.1%)
	Discarding of out of date products or chemicals	Primary nonferrous metals, nec	99	0	DK	N
	Cleanout of process equipment	Industrial inorganic chemicals, nec	70	30	150000	N
	Tank bottoms removal	Hardware, nec,plating and polishing	80	20	0	Sb(0.1-1%), Cu(500ppm-0.1%),Zn(1-10%)
Resins, tars or tarry sludge	Other cleanout or closure process	Blast furnaces and steel mills	93	5	66	N
Sludge with reactive sulfides	Filtration/centrifuging	Industrial inorganic chemicals, nec	95	5	28000	H2S(1-10%)
	Tank bottoms removal	Cyclic crudes and intermediates	61	34	200	Cresols(1-10%)
Soil contaminated with inorganics only	Cleanup of spill residues	Petroleum refining	100	0	4357	H2S(0.1-1%)
Spent carbon	Other one-time process	Petroleum refining	DK	DK	800	N
	Clean out of process equipment	Petroleum refining	99	1	10	N
	Solvent extraction	Petroleum refining	DK	95	8300	Hydrogen fluoride(0.1-1%), H2S(0.1-1%)

* = SUSPENDED SOLIDS
DK = DON'T KNOW
N = NONE LISTED
NA = NOT AVAILABLE
P = PRESENT

REFERENCE: USEPA 1988e

TABLE C-8 CHARACTERIZATION DATA FOR D003 OTHER REACTIVES SUBCATEGORY

WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	INDUSTRIAL DESCRIPTION	PERCENT SOLIDS	PERCENT WATER
Halogenated/Nonhalogenated Solvent mixture	Heavy ends/still bottoms removal	Industrial organic chemicals, nec, agricultural chemicals, nec	NA	0
Other halogenated organic solid	Clean out of process equipment	Abrasive products,misc. plastics products,petroleum and coal prod, nec	DK	DK
Other organic sludge	Halogenation	Industrial organic chemicals, nec	DK	0
Reactive or polymerizable organics	Halogenation	Industrial organic chemicals, nec	2	0
	Halogenation	Industrial organic chemicals, nec	1	0
Still bottoms of halogenation solvents/organics	Distillation & fractionation	Industrial organic chemicals, nec	2	0

DK = DON'T KNOW
NA = NOT AVAILABLE

REFERENCE : USEPA 1988e

APPENDIX D

DEFINITIONS OF FORBIDDEN EXPLOSIVE, CLASS A EXPLOSIVE, AND CLASS B EXPLOSIVE ACCORDING TO 49 CFR

Forbidden explosives include the following:

1. Explosive compounds, mixtures, or devices that ignite spontaneously or undergo marked decomposition when subjected to a temperature of 167°F (75°C) for 48 consecutive hours.

2. New explosive compounds, mixtures, or devices except as provided for in §173.86.

3. Explosive mixtures or devices containing an ammonium salt and a chlorate.

4. Explosive mixtures or devices containing an acidic metal salt and a chlorate.

5. Leaking or damaged packages of explosives.

6. Nitroglycerin, diethylene glycol dinitrate, or other liquid explosives not authorized by §173.53(e).

7. Loaded firearms.

8. Fireworks that combine an explosive and a detonator or blasting cap.

9. Fireworks containing yellow or white phosphorus.

10. Toy torpedoes, the maximum outside dimension of which exceeds 7/8-inch, or toy torpedoes containing a mixture of potassium chlorate, black antimony, and sulfur, with an average weight of explosive composition in each torpedo exceeding four grains.

Class A explosives include the following:

(a) Type 1. Solid explosives that can be caused to deflagrate by contact with sparks or flame such as are produced by a safety fuse or an electric squib, but cannot be detonated (see Note 1) by means of a No. 8 test blasting cap (see Note 2). Example: Black powder and low explosives.

(b) Type 2. Solid explosives that contain a liquid explosive ingredient, and which, when unconfined (see Note 3), can be detonated by means of a No. 8 test blasting cap (see Note 2); or which can be exploded in at least 50 percent of the trials in the Bureau of Explosives' Impact Apparatus (see Note 4) under a drop of 4 inches or more, but cannot be exploded in more than 50 percent of the trials under a drop of less than 4 inches. Example: High explosives, commercial dynamite containing a liquid explosive ingredient.

(c) Type 3. Solid explosives that contain no liquid explosive ingredient and which can be detonated, when unconfined (see Note 3), by means of a No. 8 test blasting cap (see Note 2); or which can be exploded in at least 50 percent of the trials in the Bureau of Explosives' Impact Apparatus (see Note 4) under a drop of 4 inches or more, but cannot be exploded in more than 50 percent of the trials under a drop of less than 4 inches. Example: High explosives, commercial dynamite containing no liquid explosive ingredient, trinitrotoluene, amatol, tetryl, picric acid, urea nitrate, pentolite, and commercial boosters.

(d) Type 4. Solid explosives that can be caused to detonate when unconfined (see Note 3), by contact with sparks or flame such as are produced by a safety fuse or an electric squib; or which can be exploded in the Bureau of Explosives' Impact Apparatus (see Note 4), in more than 50 percent of the trials under a drop of less than 4 inches. Example: Initiating and priming explosives, lead azide, fulminate of mercury, etc., and high explosives.

(e) Type 5. Desensitized liquid explosives that can be detonated separately or when absorbed in sterile absorbent cotton, by a No. 8 test blasting cap (see Note 2); but which cannot be exploded in the Bureau of Explosives' Impact Apparatus (see Note 4), by a drop of less than 10 inches. The desensitizer must not be significantly more volatile than nitroglycerine, and the desensitized explosive must not freeze at temperatures above minus °F. Example: High explosives, desensitized nitroglycerine.

(f) Type 6. Liquid explosives that can be exploded in the Bureau of Explosives' Impact Apparatus (see Note 4), under a drop of less than 10 inches. Example: Nitroglycerin. (See § 173.51(a)(3).)

(g) Type 7. An initiating device that is a metal or plastic casing containing initiating or priming explosives, Class A-Type 4, either with or without other explosives. It is activated by any one of several means, including an electrical pulse, a flame, a shock or detonation wave, mechanical impact (percussion) pressurized gas, or a high intensity light beam. It produces an explosive output that may be used to initiate another explosive or to perform work. A time delay may be incorporated in the means of applying the stimulus or in the initiating device itself.

(1) A detonator (see Note 5) is an initiating device (other than one properly described as a detonating fuze) that contains no more than 10 grams of total explosives weight, excluding ignition and delay charges per unit. The different kinds of detonators include the following:

- Blasting caps that are activated by a safety fuse.
- Blasting caps that are percussion activated.
- Blasting caps that are activated by flexible detonating cord, including:

(A) Delay connectors in plastic sheaths, which consist of a plastic sleeve that contains a suitable delay system with receptor and donor explosive charges in the center portion. Each end of the sleeve is made so that flexible detonating cord can be inserted into and locked to the connector.

(B) Delay connectors in metal tubes, which consist of a system with a receptor and donor charge positioned between two detonators, with the entire assembly placed in a metal tube having both ends open for the insertion of flexible detonating cord.

(C) Delay connectors with detonating cord pigtails, which consist of delay connectors as described in paragraph (g)(1)(iii)(B) of this section that have short lengths of detonating cord inserted into both ends and crimped in place.

(D) Nonelectric instantaneous and delay caps, which consist of blasting caps to which is assembled a length of detonating cord that may have a transfer explosive charge at the opposite end.

- Blasting caps that are activated by gas pressurization or reaction.
- Blasting caps that are activated by a shock tube.
- Electric blasting caps that are activated by an electric current.

(2) A detonating primer (see Note 6) is an initiation device for commercial use that contains more than 10 grams of total explosives weight, excluding ignition and delay charges per unit.

(3) Detonating fuzes, Class A, are used in the military service to detonate the high explosive bursting charges of projectiles, mines, bombs, torpedoes, and grenades. In addition to a powerful detonator, they may contain several ounces of a high explosive, such as tetryl or dry nitrocellulose, all assembled in a heavy steel envelope. They may also contain a small amount of radioactive component. Those that are made and packed so that they will not cause functioning of other fuzes, explosives, or explosive devices in the same or adjacent containers are classed as Class C explosives.

- Blasting caps that are activated by a safety fuse.

- Blasting caps that are percussion activated.

- Blasting caps that are activated by flexible detonating cord, including:

(A) Delay connectors in plastic sheaths, which consist of a plastic sleeve that contains a suitable delay system with receptor and donor explosive charges in the center portion. Each end of the sleeve is made so that flexible detonating cord can be inserted into and locked to the connector.

(B) Delay connectors in metal tubes, which consist of a system with a receptor and donor charge positioned between two detonators, with the entire assembly placed in a metal tube having both ends open for the insertion of flexible detonating cord.

(C) Delay connectors with detonating cord pigtails, which consist of delay connectors as described in paragraph (g)(1)(iii)(B) of this section that have short lengths of detonating cord inserted into both ends and crimped in place.

(D) Nonelectric instantaneous and delay caps, which consist of blasting caps to which is assembled a length of detonating cord that may have a transfer explosive charge at the opposite end.

- Blasting caps that are activated by gas pressurization or reaction.

- Blasting caps that are activated by a shock tube.

- Electric blasting caps that are activated by an electric current.

(2) A detonating primer (see Note 6) is an initiation device for commercial use that contains more than 10 grams of total explosives weight, excluding ignition and delay charges per unit.

(3) Detonating fuzes, Class A, are used in the military service to detonate the high explosive bursting charges of projectiles, mines, bombs, torpedoes, and grenades. In addition to a powerful detonator, they may contain several ounces of a high explosive, such as tetryl or dry nitrocellulose, all assembled in a heavy steel envelope. They may also contain a small amount of radioactive component. Those that are made and packed so that they will not cause functioning of other fuzes, explosives, or explosive devices in the same or adjacent containers are classed as Class C explosives.

(h) Type 8. Any device or solid or liquid compound or mixture that is not specifically included in any of the above types, and which under special conditions may be so designated and examined by the Bureau of Explosives or the Bureau of Mines, U.S. Department of the Interior, and approved by the Director, OHMT. Example: Shaped charges, commercial.

(1) A shaped charge, commercial, consists of a plastic, paper, or other suitable container composed of a charge of not to exceed 8 ounces of a high explosive containing no liquid explosive ingredient and with a hollowed-out portion (cavity) lined with a rigid material. Detonators or other initiating elements may not be assembled in the device unless examined by the Bureau of Explosives and approved by the Director, OHMT.

(i) Ammunition for cannon. Ammunition for cannon is fixed, semifixed, or separate loading ammunition that is fired from a cannon, mortar, gun howitzer, or recoilless rifle.

(j) Ammunition for cannon with projectiles. Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles, or shell is fixed ammunition assembled in a unit consisting of the cartridge case containing the propelling charge and primer, and the projectiles, or shell, fuzed or unfuzed. Detonating fuzes, tracer fuzes, explosive or ignition devices, or fuze parts with explosives contained therein may not be assembled in ammunition or included in the same outside package unless shipped by or for the Department of Defense (DOD) and in accordance with established practices and procedures specified by DOD.

(k) Explosive projectiles. Explosive projectiles are shells, projectiles, warheads, or rocket heads, loaded with explosives or bursting charges, with or without other materials, for use in cannons, guns, tubes, mortars, or other firing or launching devices.

(l) Grenades. Grenades, hand or rifle, are small metal or other containers designed to be thrown by hand or projected from a rifle. They are filled with an explosive or a liquid, gas, or solid material such as a toxic or tear gas or an incendiary or smoke producing material and a bursting charge. When shipped without explosives or bursting charges, see §§ 173.100(6), 173,330, 173.350, and 173.385.

(m) Explosive bombs. Explosive bombs are metal or other containers filled with explosives. They are used in warfare and include aeroplane bombs and depth bombs.

(n) Explosive mines. Explosive mines are metal or composition containers filled with a high explosive.

(o) Explosive torpedoes. Explosive torpedoes, such as are used in warfare, are metal devices containing a means of propulsion and a quantity of high explosives.

(p) Rocket ammunition. Rocket ammunition (including guided missiles) is ammunition designed for launching from a tube, launcher, rails, trough, or other launching device, in which the propellant material is a solid propellant explosive. It consists of an igniter, rocket motor, and projectile (warhead) either fuzed or unfuzed, containing high explosives or chemicals. Rocket ammunition may be shipped completely assembled or may be shipped unassembled in one outside container.

(q) Ammunition for small arms with explosive projectiles or incendiary projectiles. Ammunition for small arms with explosive projectiles and ammunition for small arms with incendiary projectiles is fixed ammunition of caliber 20 millimeters to be used in machine guns or cannons, and consists of a metallic cartridge case, the primer and the propelling charge, with explosive projectile or incendiary projectile with or without detonating fuze; the component parts necessary for one firing being all in one assembly. Detonating fuzes, tracer fuzes, explosive or ignition devices, or fuze parts with explosives contained therein must not be assembled in ammunition or included in the same outside package unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the U.S. Government or unless of a type approved by the Department.

(r) Chemical ammunition. Chemical ammunition used in warfare is all kinds of explosive chemical projectiles, shells, bombs, grenades, etc., loaded with toxic, tear, or other gas, smoke or incendiary agent; also such miscellaneous apparatus as cloud-gas cylinders, smoke generators, etc., that may be utilized to project chemicals.

(s) Boosters, bursters, and supplementary charges. Boosters and supplementary charges consist of a casing containing a high explosive and are used to increase the intensity of an explosion of the detonator of a detonating fuze. Bursters consist of a casing containing a high explosive and are used to rupture a projectile or bomb to permit release of its contents.

(t) Jet thrust units (jato), Class A explosives; rocket motors, class A explosives; igniters, jet thrust (jato), Class A explosives; and igniters, rocket motor, Class A explosives.

(1) Jet thrust units (jato), class A explosives, are metal cylinders containing a mixture of chemicals capable of burning rapidly and producing considerable pressure. Under certain conditions, the chemical fuel with which the unit is loaded may explode. Jet thrust units are designed to be ignited by an electric igniter. They are used to assist aeroplanes to take off.

(2) Rocket motor, Class A explosives, is a device containing a propelling charge and consisting of one or more continuous type combustion unit(s) closed at one end (closure may be an igniter with a thrust plate) and with a nozzle(s) at the other end. (The rocket motor carries its own solid oxidizer-fuel combination.) The propelling charge consists of a mixture of chemicals and/or chemical compounds which, when ignited, is capable of burning rapidly and producing considerable pressure and which will sustain a detonation. Rocket motors, Class A explosives, should be nonpropulsive in shipment (see paragraphs (t)(2)(i) and (ii) of this section). Rocket motors, Class A explosives, are designed to be ignited by an electrically actuated device that may be an igniter, or by other means. They are used to propel and/or provide thrust for guided missiles, rockets, or spacecraft.

(i) A rocket motor to be considered "nonpropulsive" must be capable of unrestrained burning and will not move appreciably in any direction when ignited by any means. Blast deflectors, thrust neutralizers, or other similar devices must be proven adequate by test prior to authorization for use.

(ii) Rocket motors, Class A explosives, may be shipped in a propulsive state only under conditions approved by the Department of Defense.

(3) Igniters, jet thrust (jato), Class A explosives, and igniters, rocket motors, Class A explosives, are devices consisting of an electrically operated or remotely controlled ignition element and a charge of fast-burning composition meeting the definition prescribed for Type 1 Class A explosives (see paragraph (a) of this section), assembled in a unit for use in igniting the propelling charge of jet thrust units or rocket motors.

(u) Charged well casing jet perforating guns. Charged well casing jet perforating guns are steel tubes or metallic strips into which are inserted shaped charges connected in series by primacord. Shaped charges must be of a type described in paragraph (h)(1) of this section, except that each shaped charge installed in the steel tube or metallic strip shall contain not over 4 ounces of high explosive. Charged well casing jet perforating guns must not be transported with blasting caps, electric blasting caps, or other firing devices affixed to or installed in the guns.

(v) Type 9. Propellant explosives, Class A, are solid chemicals or solid chemical mixtures that are designed to function by rapid combustion of successive layers, generally with little or no smoke. The combustion is controlled by composition, size, and form of grain. Propellant explosives, Class A, include some types of smokeless powder and some types of solid propellant explosives for jet thrust units, rockets, or other devices. Any propellant explosive is Class A which detonates in any one out of five trials when tested in the packages in which it is offered for transportation. In conducting the test, one propellant container shall be surrounded by inert loaded containers of the same weight, including one inert container placed on top of the propellant container. The propellant shall be ignited by means of a commercial electric squib placed within 4 inches of the bottom of the container. The presence of a crater and absence of flame shall be considered as evidences of detonation.

(w) Detonating cord is a device consisting of a core of pentaerythrite tetranitrate, cyclotrimethylene-trinitramine, or similar explosive overspun with tapes, yarns, and plastics or waterproofing compounds without wire countering.

FOOTNOTES

Note 1: The detonation test is performed by placing the sample in an open-end fiber tube that is set on the end of a lead block approximately 1-1/2 inches in diameter and 4 inches high, which, in turn, is placed on a solid base. A steel plate may be placed between the fiber tube and the lead block.

Note 2: A No. 8 test blasting cap is one containing 2 grams of a mixture of 80 percent mercury fulminate and 20 percent potassium chlorate, or a cap of equivalent strength.

Note 3: "Unconfined," as used in this section, does not exclude the use of a paper or soft fiber tube wrapping to facilitate tests.

Note 4: The Bureau of Explosives Impact Apparatus is a testing device designed so that a guided 8-pound weight may be dropped from predetermined heights so as to impact specific quantities of liquid or solid materials under fixed conditions. Detailed prints may be obtained from the Bureau of Explosives, 1920 L Street, N.W., Washington, D.C. 20036.

Note 5: See § 173.100(gg) for criteria that determine whether a particular type of detonator can be classed as a Class C explosive.

Note 6: See § 173.100(hh) for criteria that determine whether a particular type of detonating primer can be classed as a Class C explosive.

Class B explosives include the following:

§ 173.87 Explosives in mixed packaging.

Unless specifically authorized by Parts 110-189 of this subchapter, explosives may not be packed in the same outside packaging with other articles. Inside packages of different explosives (except detonators and initiating explosives) may be packed in one outside packaging in accordance with the requirements of this subchapter if the gross weight of each inside package does not exceed 8 ounces and the gross weight of the completed package does not exceed 50 pounds.

(a) Explosives, Class B, are defined as those explosives that in general function by rapid combustion rather than detonation and include some explosive devices such as special fireworks, flash powders, some pyrotechnic signal devices, and liquid or solid propellant explosives, which include some smokeless powders. These explosives are further described in paragraphs (b) to (g) of this section.

(b) Ammunition for cannon with empty projectiles, inert-loaded projectiles, solid projectiles or without projectiles, or shell, and catapult charges exceeding 2 inches in diameter, is fixed ammunition assembled in a unit consisting of the cartridge case containing the propelling charge and primer with empty, inert-loaded, or solid projectiles, or without projectiles, which is fired from a cannon, mortar, gun, howitzer, or recoilless rifle.

(c) Rocket ammunition is fixed ammunition that is fired from a tube, launcher, rails, trough, or other device as distinguished from cannon ammunition, which is fired from a cannon, gun, or mortar. It consists of an igniter, a rocket motor, empty projectile, an inert-loaded projectile, or a solid projectile.

(d) Special fireworks are manufactured articles designed primarily for the purpose of producing visible or audible pyrotechnic effects by combustion or explosion. (See §173.100(r) for common fireworks.) Examples are toy torpedoes, railway torpedoes, some firecrackers and salutes, exhibition display pieces, aeroplane flares, illuminating projectiles, incendiary projectiles, incendiary bombs or incendiary grenades, and smoke projectiles or smoke bombs fuzed or unfuzed and containing expelling charges but without bursting charges, flash powders in inner units not exceeding 2 ounces each, flash sheets in interior packages, flash powder or spreader cartridges containing not over 72 grains of flash powder each (see § 173.60 for shipments made as low explosives) and flash cartridges consisting of a paper cartridge shell, small-arms primer, and flash composition, not exceeding 180 grains all assembled in one piece. Fireworks must be in a finished state, exclusive of mere ornamentation, as supplied to the retail trade and must be so constructed and packed that loose pyrotechnic composition will not be present in packages in transportation.

(e) Jet thrust units (jato), Class B explosives; rocket motors, Class B explosives; igniters, jet thrust (jato), Class B explosives; and igniters, rocket motors, Class B explosives:

(1) Jet thrust units (jato), Class B explosives, are metal cylinders containing a mixture of chemicals capable of burning rapidly and producing considerable pressure. Jet thrust units are designed to be ignited by an electric igniter. They are used to assist aeroplanes to take off.

(2) Rocket motor, Class B explosives, is a device containing a propelling charge and consisting of one or more continuous type combustion unit(s), closed at one end (closure may be an igniter with a thrust plate) and with a nozzle(s) at the other end. The propelling charge consists of a mixture of chemicals and/or chemical compounds which when ignited is capable of burning rapidly and producing considerable pressure and which will not sustain a detonation. (The rocket motor carries its own solid oxidizer-fuel combination.) Rocket motors, Class B explosives, should be nonpropulsive in shipment (see paragraphs (e)(2)(i) and (ii) of this section). Rocket motors, Class B explosives, are designed to be ignited by an electrically actuated device that may be an igniter, or by other means. They are used to propel and/or provide thrust for guided missiles, rockets, or spacecraft.

(i) A rocket motor to be considered "nonpropulsive" must be capable of unrestrained burning and will not move appreciably in any direction when ignited by any means. Blast deflectors, thrust neutralizers, or other similar devices must be proven by test prior to authorization for use.

(ii) Rocket motors, Class B explosives, may be shipped in a propulsive state only under conditions approved by the Department of Defense or the National Aeronautics and Space Administration.

(3) Igniters, jet thrust (jato), Class B explosives, and igniters, rocket motor, Class B explosives, are devices consisting of an electrically operated or remotely controlled ignition element and a fast burning composition which functions by rapid burning rather than detonation, assembled in a unit for use in igniting the propelling charge of jet thrust units, rocket motors, or rocket engines.

(f) Propellant explosives, Class B, are solid or liquid chemicals or chemical mixtures that function by combustion. The combustion is controlled by composition, size, form of grain, or other chemical or mechanical means. Any propellant is Class B that fails to detonate in five trials when tested (see Note 2) in the package in which it is offered for shipment. Propellant explosives, Class B, include smokeless powder for small arms (see Note 4), smokeless powder for cannon, liquid monopropellant fuel (see Note 3), smokeless powder, or solid propellant explosives for rockets, jet thrust units, or other devices. Black powder is not included in this classification and is defined specifically in §173.53.

(g) Explosives power devices, Class B, are devices designed to operate ejecting apparatus or other mechanisms by means of a propellant explosive, Class B, and differ from explosive power devices, Class C, in that they contain larger or more powerful propellants. The devices must not rupture on functioning and must be of a type examined by the Bureau of Explosives and approved by the Director, OHMT, except as otherwise provided in §173.51(b) and §173.86(a).

Note 1: Fire-extinguisher charges containing not to exceed 50 grains of propellant explosives per unit are exempt from the regulations in Parts 170-189 of this chapter.

Note 2: In conducting the test, one propellant container shall be surrounded by inert loaded containers of the same weight, including one inert container placed on top of the propellant container. The propellant shall be ignited by means of a commercial electric squib placed within 4 inches of the bottom of the container. The presence of a crater and absence of flame shall be considered as evidences of detonation.

Note 3: A liquid monopropellant fuel is defined as any propellant in which the fuel and the oxidizer are physically or chemically combined in one form.

Note 4: Smokeless powder for small arms in quantities not to exceed 100 pounds net weight in one car or motor vehicle, except shipments by, for, or to the Department of the Army, Navy, or Air Force of the United States Government, shall be classed as a flammable solid for purposes of transportation when packaged in accordance with § 173.197a.

(h) Starter cartridges, jet engine, Class B explosives, consist of plastic and/or rubber cases, each containing a pressed cylindrical block of propellant explosive and having in the top of the case a small compartment that encloses an electrical squib, small amounts of black powder, and smokeless powder, which constitutes an igniter. The starter cartridge is used to activate a mechanical starter for jet engines.

(i) Rocket engine (liquid), Class B explosives, is a complete, self-contained rocket propulsion unit that contains an oxidizer and a fuel, each separated by an aluminum or stainless steel wall of not less than 0.250-inch thickness. Double walls are permitted. Pressurization of the propellant tanks is by use of a gas generator. The ignition source must be in an unarmed position for shipment. Rocket engines (liquid) are used to propel or provide thrust for rockets, missiles, or spacecraft.

APPENDIX E

WASTE CHARACTERIZATION, INDUSTRIAL DESCRIPTIONS, AND ANALYTICAL PROBLEMS ASSOCIATED WITH WASTES CONTAINING P AND U REACTIVE LISTING CONSTITUENTS

TABLE E-1 CHEMICAL STRUCTURES FOR REACTIVE P AND U LISTING CONSTITUENTS

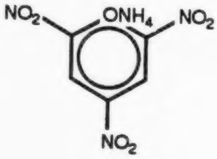
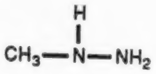
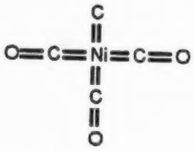
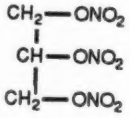
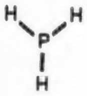
Waste code	*Chemical constituent*	*Structure*	*Molecular weight*
P006	Aluminum phosphide	Al—P	58.0
P009	Ammonium picrate		246.1
P015	Beryllium dust	Be	9.0
P056	Fluorine	Fl_2	38.0
P068	Methyl hydrazine	 $CH_3-\overset{\overset{H}{\vert}}{N}-NH_2$	46.1
P073	Nickel carbonyl		170.7
P081	Nitroglycerin	 CH_2-ONO_2 $CH-ONO_2$ CH_2-ONO_2	227.1
P087	Osmium tetroxide	OsO_4	254.2
P096	Phosphine		34.0
P105	Sodium azide	Na—N—N≡N	65.0

TABLE E-1 (CONTINUED)

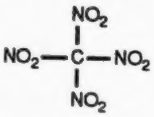
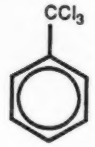
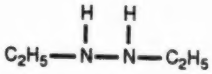
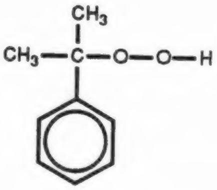
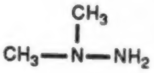
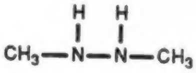
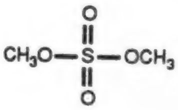
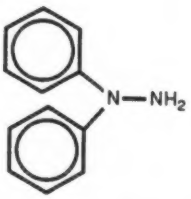
Waste code	*Chemical constituent*	*Structure*	*Molecular weight*
P112	Tetranitromethane	 $NO_2-\overset{NO_2}{\underset{NO_2}{C}}-NO_2$	196.0
P122/U249	Zinc Phosphide	Zn_3P_2	258.1
U023	Benzotrichloride		195.5
U086	1,2-Diethylhydrazine	 $C_2H_5-\overset{H}{N}-\overset{H}{N}-C_2H_5$	88.2
U096	a,a-Dimethylbenzyl-hydroperoxide		152.1
U098	1,1-Dimethylhydrazine	 $CH_3-\overset{CH_3}{N}-NH_2$	60.1
U099	1,2-Dimethylhydrazine	 $CH_3-\overset{H}{N}-\overset{H}{N}-CH_3$	60.1
U103	Dimethyl Sulfate	 $CH_3O-\overset{O}{\underset{O}{S}}-OCH_3$	126.1
U109	Diphenylhydrazine		184.2

TABLE E-1 (CONTINUED)

Waste code	*Chemical constituent*	*Structure*	*Molecular weight*
U133	Hydrazine	$H_2N—NH_2$	32.1
U134	Hydrogen Fluoride	$H—F$	20.1
U135	Hydrogen Sulfide	$H—S$	34.1
U160	Methyl Ethyl Ketone Peroxide	$CH_3CH_2—C—O—O—CH_3$	88.0
U189	Phosphorus Sulfide	P_2S_5	222.3

TABLE E-2 P AND U WASTES CONTAINING REACTIVE LISTING CONSTITUENTS

WASTE CODE	WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	QUANTITY	PERCENT SOLIDS	PERCENT WATER	CONSTITUENTS PRESENT IN PERCENTAGE LEVELS
P006(MIXED)	Caustic solution with metals&cyanides	Wastewater treatment	20 T	P	P	Cd(1-10%),As & cmpds,NOS(1-10%), Cyanides,NOS(1-10%)
P009(MIXED)	Mixed lab packs/empty containers	Laboratory wastes/cleanup of spill residues	16 T	DK	DK	N
P015	Metal scale,filings or scrap	Size reduction	1 T	ND	ND	N
P015	Other "dry" ash,slag or thermal residue/metal scale, or scrap	Other waste production process/combustion processes	24 G	99	0	Beryllium & cmpds,NOS(10-25%)
P015	Metal scale,filings or scrap	Other process	120 G	99	NA	Be(75-90%),Cu(1-10%),Ni(1-10%),Zn(1-10%)
P015	Other metal salts/chemicals	Laboratory wastes/discarding of off-spec material	0	99	0	Be(>90%)
P015(MIXED)	Metal scale,filings or scrap	Physical scraping/removing	3 T	98	1	Be(1-10%)
P015(MIXED)	Soil contaminated with organics only/reactive cyanide chemicals	Discarding of out-of-date products or chemicals	2 T	99	DK	N
P015(MIXED)	Mixed lab packs	Other process	8000 G	20	20	N
P015(MIXED)	Metal scale,filings or scrap	Size reduction	217 G	95	DK	Be(1-10%),Pb(1-10%),Cyanides(0.1-1%)
P056	Inorganic gases	Discarding of out-of-date products or chemicals	1 T	0	0	Fluorine(>90%)
P056(MIXED)	Other untreated waste	Surface coating	42 G	10	90	Cd(10-25%),Cr(10-25%),Cr+6(1-10%),Fluorine(500ppm-0.1%)
P068	Other inorganic liquid	Discarding of off-spec material	1000 T	0	99	Methyl hydrazine(1-10%)
P068	Other inorganic liquid	Physical scraping or removing/flush rinsing	120 G	DK	DK	Hydrazine(1-10%)
P068(MIXED)	Lab packs of old chemicals only	Laboratory wastes	1 T	NA	NA	N
P068(MIXED)	Other inorganic liquid	Laboratory wastes	100 G	0	95	1,2-Dimethyl hydrazine(1-10%),Methyl hydrazine(1-10%),Hydrazine(1-10%)
P068(MIXED)	Lab packs of debris only	Other waste production process	5 T	99	DK	Hydrazine(0.1-1%),Methyl hydrazine(01.-1%)
P087	Concentrated off-spec or discarded product	Discarding of out-of-date products or chemicals	ND	DK	DK	Osmium tetroxide(>90%)
P087	Other metal salts/chemicals	Discarding of out-of-date products or chemicals	ND	99	NA	Osmium tetroxide(>90%)
P087	Other metal salts/chemicals	Laboratory wastes/ discarding of out-of-date chemicals	1 G	99	0	Osmium tetroxide(>90%)
P087	Concentrated off-spec or discarded product	Laboratory wastes/ discarding of out-of-date chemicals	1 T	DK	DK	Osmium tetroxide(500PPM-0.1%)
P087(MIXED)	Mixed lab packs	Laboratory wastes	56 G	95	4	Osmium tetroxide(0.1-1%),Phenol(0.1-1%),Aniline(0.1-1%)
P087(MIXED)	Mixed lab packs	Laboratory wastes/ discarding of out-of-date chemicals	1 T	P	P	N
P087(MIXED)	Lab packs of old chemicals only	Laboratory wastes	1 T	P	P	N
P105	Concentrated off-spec or discarded product	Discarding of out-of-date products or chemicals	1 T	DK	DK	N
P105	Other metal salts/chemicals	Discarding of out-of-date products or chemicals	1 T	NA	DK	N
P105	Other waste inorganic chemicals	Discarding of out-of-date products or chemicals	1 T	99	0	N
P105	Other reactive salts/chemicals	Laboratory wastes/ discarding of out-of-date chemicals	1 T	99	0	N
P105	Concentrated off-spec or discarded product	Laboratory wastes/ discarding of out-of-date chemicals	1 T	DK	99	N
P105(MIXED)	Caustic sol'n w/metals&cyanides	Laboratory wastes	110 G	DK	DK	N
P105 (MIXED)	Aqueous waste w/low other toxic organics	Distillation and fractionation	1416000 T	6	90	N
P105 (MIXED)	Sediment or lagoon dragout contaminated with organics	Decantation/sedimentation	104 T	40	60	N
P105(MIXED)	Concentrated off-spec or discarded product	Discarding of out-of-date products or chemicals	ND	99	DK	N
P105(MIXED)	Other waste inorganic chemicals	Discarding of out-of-date products or chemicals	1 T	NA	NA	N
P122	Concentrated off-spec or discarded product	Discarding of out-of-date products or chemicals	1 T	DK	DK	Zn(10-25%), Zinc phosphide(10-25%)
P122	Other reactive salts/chemicals	Discarding of out-of-date products or chemicals	1 T	100	ND	Zinc phosphide(75-90%),
P122	Inorganic gases	Laboratory wastes/ discarding of out-of-date chemicals	1 G	99	0	Zn(75-90%), Zinc phosphide(>90%)
U023	Halogenated solvent	Laboratory wastes/ discarding of out-of-date chemicals	2 G	0	0	Benzotrichoride(>90%)
U023	Aqueous waste w/low other toxic organics	Cleanup of spill residues	148745 G	5	95	N
U023(MIXED)	Cont. Soil or cleanup residue	Cleanup of spill residues	1 T	99	0	N
U096(MIXED)	Other organic liquid	Discarding of out-of-date products or chemicals	180 G	5	85	N
U096(MIXED)	Other "dry" ash,slag or thermal residue	Other pollution control or waste treatment process	15 T	95	5	N
U096(MIXED)	Other "dry" ash,slag or thermal residue	Other pollution control or waste treatment process	15 T	95	5	N
U096(MIXED)	Reactive organic solid	Other waste production process	18 T	ND	ND	Methyl ethyl ketone peroxide(10-25%)
U098	Other organic liquid/contaminated off-spec or discarded product	Discarding of out-of-date products or chemicals	1 T	DK	DK	1,2-Dimethylhydrazine(>90%)
U098	Nonhalogenated solvent	Laboratory wastes/ discarding of out-of-date chemicals	6 G	0	0	1,1-Dimethylhydrazine(>90%)
U098	Wastewater or aqueous mixture	Other waste production process	44 T	0	95	1,1-Dimethylhydrazine(0.1-1%),Methanol(1-10%)
U099	Other organic liquid	Laboratory wastes	1 G	0	0	1,2-Dimethylhydrazine(10-25%)
U103	Spent acid w/metals	Other process	16380 G	ND	ND	N
U103	Nonhalogenated solvent	Laboratory wastes/ discarding of out-of-date chemicals	1 G	0	0	Dimethyl sulfate(>90%)
U103(MIXED)	Spent acid w/metals	Dip rinsing/electroplating	110 G	3	45	N
U109	Lab packs of old chemicals only	Laboratory wastes/ discarding of out-of-date chemicals	1 G	99	0	1,2-Diphenylhydrazine(>90%)
U133	Reactive or polymerizable organic liquid/organic gases	Discarding of off-spec material	1 T	NA	DK	N
U133	Other organic liquid	Discarding of out-of-date products or chemicals	220 G	0	40	Hydrazine(25-50%)

TABLE E-2 P AND U WASTES CONTAINING REACTIVE LISTING CONSTITUENTS

WASTE CODE	WASTE DESCRIPTION	SOURCE OF WASTE GENERATION	QUANTITY	PERCENT SOLIDS	PERCENT WATER	CONSTITUENTS PRESENT IN PERCENTAGE LEVELS
U133	Nonhalogenated solvent	Laboratory wastes/ discarding of out-of-date chemicals	1 G	0	0	Hydrazine(>90%)
U133	Concentrated off-spec or discarded product	Laboratory wastes/ discarding of out-of-date chemicals	1 T	DK	DK	Hydrazine(>90%)
U133(MIXED)	Other aqueous waste with low dissolved solids	Discarding of out-of-date products or chemicals	1 T	0	80	Hydrazine(10-25%)
U133(MIXED)	Nonhalogenated solvent	Reaction/synthesis media processing	91 T	DK	DK	N
U133(MIXED)	Other organic liquid	Clean out of process equipment	0	DK	DK	N
U133(MIXED)	Empty or crushed metal drums or containers	Other waste production process	0	99	1	N
U133(MIXED)	Other inorganic liquid/aqueous waste with low	Accidental spills or discharges	ND	0	0	Hydrazine(>90%)
U133 (MIXED)	Wastewater or aqueous mixture	Clean out of process equipment/cleanup of spills	521448 T	1	98	Methanol(500ppm-0.1%),
U133(MIXED)	Soil contaminated with organics only/inorganic gases	Cleanup of spill residues	1 T	100	0	N
U133(MIXED)	Acidic aqueous waste	Discarding of off-spec material/cleanup of spills	595 G	0	65	Hydrazine(25-50%)
U133(MIXED)	Aqueous waste w/other reactives(explosives)	Accidental spills or discharges	2 G	0	65	Hydrazine(25-50%)
U133(MIXED)	Other reactive salts/chemicals	Other waste production process/lab wastes	82 G	99	0	Hydrazine(0.1-1%)
U133(MIXED)	Other organic liquid	Discarding of out-of-date products or chemicals	0	NA	15	Hydrazine(75-90%)
U133 (MIXED)	Other inorganic solids	Filtration/centrifuging	3 T	100	NA	N
U133(MIXED)	Empty or crushed metal drums or containers	Other remedial action/cleanup	0	99	DK	N
U134	Other untreated waste	Laboratory wastes	100 G	0	10	Hydrogen fluoride(25-50%)
U134	Other inorganic liquid	Discarding of off-spec material	4 T	NA	NA	N
U134	Other treatment residue	Other pollution control or waste treatment process	40500 G	NA	50	N
U134	Acidic aqueous waste	Other process	880 T	0	97	N
U134	Acidic aqueous waste	Other process	132 G	DK	DK	N
U134	Still btms of halogenated solvents or other organic liquids	Other process	1265 G	DK	DK	DK
U134 (MIXED)	Spent acid without metals	Distillation and fractionation/heavy ends or still bottoms	28710 G	P	P	N
U134 (MIXED)	Other f or k waste, as described	None	300 G	DK	DK	N
U134 (MIXED)	Spent acid without metals	None	550 G	DK	DK	Hydrogen fluoride(25-50%)
U134 (MIXED)	spent acid without metals	Other waste production process	3400 G	P	P	N
U134 (MIXED)	Acidic aqueous waste	Other waste production process	26615 G	0	98	Hydrogen fluoride(1-10%)
U134 (MIXED)	Mixed lab packs	Discarding of out-of-date products or chemicals	1980 G	P	P	N
U134 (MIXED)	Empty fiber or plastic containers	Other one-time process	18 G	99	1	Hydrogen fluoride(500ppm-0.1%)
U134 (MIXED)	Wastewater or aqueous mixture	Other cleaning or degreasing process/stripping	19300 G	0	99	N
U134 (MIXED)	Other waste inorganic chemicals	Cleanup of spill residues	1595 G	P	P	Hydrogen fluoride(1-10%)
U134 (MIXED)	Spent acid without metals	Stripping/clean out of process equipment	180 G	5	62	Hydrogen fluoride(>90%)
U134 (MIXED)	Spent acid without metals	Other process	23000 G	0	74	N
U134 (MIXED)	Other aqueous waste with low dissolved solids	Wastewater treatment	997000 G	1	99	N
U134 (MIXED)	Other organic liquid	Laboratory wastes	3 T	NA	NA	Hydrogen fluoride(1-10%),Chlorinated fluorocarbons,NOS(500ppm-0.1%)
U134 (MIXED)	Spent acid without metals	Pickling	2000 G	1	39	N
U134 (MIXED)	Concentrated aqueous solution of other organics	Discarding of off-spec material	1 T	DK	DK	N
U134 (MIXED)	Waste oil	Clean out of process equipment	990 G	0	1	N
U134 (MIXED)	Empty or crushed metal drums or containers	Closure of process equipment	15 T	98	1	N
U134 (MIXED)	Mixed lab packs	Laboratory wastes	1 T	ND	ND	N
U134 (MIXED)	Mixed lab packs	Laboratory wastes	1 T	ND	ND	ND
U134 (MIXED)	Apcd sludge/scrubber water	Flue gas desulfurization/other pollution control	ND	1	98.5	Hydrogen fluoride(500ppm-0.1%)
U135	Inorganic gases	Combustion processes	1135 T	0	DK	N
U135	Concentrated off-spec or discarded product	Discarding of out-of-date products or chemicals	1 T	DK	DK	N
U135	Solidified treatment residue	Other pollution control or waste treatment process	9 T	DK	DK	N
U135	Inorganic gases	Laboratory wastes/ discarding of out-of-date chemicals	0	0	0	N
U135(MIXED)	Other inorganic liquid	Other waste production process	224220 T	P	P	N
U135(MIXED)	Other waste inorganic chemicals	Discarding of out-of-date products or chemicals	1 T	90	DK	N
U160	Concentrated off-spec or discarded product	Other waste production process	1 T	0	0	Methyl ethyl ketone peroxide(25-50%)
U189(MIXED)	Contaminated soil or cleanup residue	Closure of surface impoundments	216000 G	88	10	N

DK = DON'T KNOW
G = GALLONS
N = NONE LISTED
NA = NOT AVAILABLE
ND = NO DATA
P = PRESENT
T = TONS

REFERENCE : USEPA 1988e

Table E-3 Generation Information for Reactive U and P Wastes According to the 1986 TSDR Survey

Waste code	EPA Region	State	SIC codes	Industry	Volume
P006-Aluminum phosphide	IV	SC	3731/9711	Ship building and repairing/ National security	0.5T
P009-Ammonium picrate					
P015-Beryllium dust	II	NY	7301		3.0G
	III	MD	3764	Space propulsion units and parts	24.0G
		VA	9711	National security	1.0T
	IV	FL	9199/9711/ 3471/3721	General government/national Security/plating and polishing/ Aircraft	1.0T
		SC	3731/9711	Ship building and repairing/ national security	3.0T
	V	OH	3641	Electric lamps	1.0P
	VI	TX	3483/2892	Ammunition, except for small arms/explosives	8.0T
	VIII	CO	3761/3764/ 7391/3769	Guided missiles and space vehicles/space propulsion units and parts research and development laboratories/space vehicle equipment	660.0G, 18.0T
	IX	CA	3679/9661/ 2999	Electronic components/space research and technology/petroleum and coal products	1.0T
			3629/3832/ 3671/3693	Electrical industrial apparatus/ optical instruments and lenses/ electron tubes, receiving type/ x-ray apparatus and tubes	27.0T
			3761	Guided missiles and space vehicles	1.0G
			3699	Electrical equipment and supplies	1608.0G
	X	WA	9711/8922/ 4911/1541	National security/noncommercial research organizations/electric services/industrial buildings and warehouses	1.0T
P056-Fluorine	II	NJ	2869/2833	Industrial organic chemicals/ medicinals and botanicals	1.0T
P068-Methyl hydrazine	III	DE	2800	General chemical manufacturing	831.0P
	V	WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
	VI	NM	9661	Space research and technology	30,000G
P073-Nickel carbonyl	III	DE	2800	General chemical manufacturing	1.0P
P081-Nitroglycerin					

Table E-3. (Continued)

Waste code	EPA Region	State	SIC codes	Industry	Volume
P087-Osmium tetroxide	III	DE	2800	General chemical manufacturing	1.5P
		PA	2647/2611	Sanitary paper products/pulp mills	1.0P
	IV	NC	9199	General government	1.0T
	V	IL	8221/2800/ 8071/2833	Colleges and universities/ general chemical manufacturing/ medical laboratories/medicinals and botanicals	161.0G
		OH	7391	Research and development	1.0G
		WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
	VI	TX	8062/8071	General medical and surgical hospitals/medical laboratories	64.0P
	VIII	MO	8221/8062	Colleges and universities/general medical and surgical hospitals	1.0T
P096-Phosphine	V	NM	8922/9199	Noncommercial research organizations/general government	1.0G
	VI	WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
P105-Sodium azide	I	CT	2834		
	II	NJ	2869/2819	Industrial organic chemicals/ industrial organic chemicals	1.0T
			2800/2821/ 2869/2899	General chemical manufacturing/ plastic materials and resins/ industrial organic chemicals/ chemical preparations	1.0T
			2834	Pharmaceutical preparations	1.0T
			2899/2819/ 2869	Chemical preparations/industrial inorganic chemicals/industrial organic chemicals/chemical preparations	1.0T
			2834/2831	Pharmaceutical preparations/ biological products	1.0T
		NY	2800	General chemical manufacturing	1.0T
	III	DE	2899	Chemical preparations	1.0T
			2800	General chemical manufacturing	61.0T
		PA	2833/2379	Medicinals and botanicals/ agricultural chemicals	2.0G
	IV	NC	9199	General government	1.0T
	V	OH	2879/2869/ 2816/2819	Agricultural chemicals/ industrial organic chemicals/ inorganic pigments/industrial inorganic chemicals	10.0P
		WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
	VI	MO	2869/2892/ 8911/3662	Industrial organic chemicals/ explosives/engineering and	1.0T

Table E-3 (Continued)

Waste code	EPA Region	State	SIC codes	Industry	Volume
P105-(continued)				architectural services/radio and TV communication equipment	
	VI	MO	8221/8062	Colleges and universities/ general medical and surgical hospitals	1.0T
		TX	8062/8071	General medical and surgical hospitals/medical laboratories	77.0P
	X	WA	9711/8922/ 4911/1541	National security/noncommercial research organizations/electric services/industrial buildings and warehouses	5.0P
P112-Tetranitromethane					
P122-Zinc phosphide (>10%)	V	OH	3641	Electric lamps	1.0P
U023-Benzotrichloride	II	NY	2800/2812 2819/2869	General chemical manufacturing/ alkalies and chlorine/industrial inorganic chemicals/industrial organic chemicals	626.0T
U086-N,N-Diethylhydrazine	V	WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
U096-a,a-Dimethyl(benzyl hydroperoxide)					
U098-1,1-Dimethylhydrazine	II	NJ	2899/2819/ 2869	Chemical preparations/industrial inorganic chemicals/industrial organic chemicals	1.0T
	V	OH	7391	Research and development laboratories	1.0G
		WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
U099-1,2-Dimethylhydrazine					
U103-Dimethyl sulfate	I	MA	4226/4959/ 2899	Special warehousing and storage/ sanitary services/chemical preparation	12.0G
	II	NY	7301		2.0G
	III	DE	2800	General chemical manufacturing	1.0P
	IV	NC	9199	General government	1.0G
	V	WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G

Table E-3 (Continued)

Waste code	EPA Region	State	SIC codes	Industry	Volume
U109-1,2-Diphenylhydrazine	V	MI	2869/2879	Industrial organic chemicals/ agricultural chemicals	5.0T
		WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
U133-hydrazine	I	CT	2834	Pharmaceutical preparations	2.0T
		MA	4226/4959/ 2899	Special warehousing and storage/ sanitary services/chemical preparations	55.0G
	II	NJ	7391	Research and development laboratories	1.0G
	III	DE	2800	General chemical manufacturing	17.0P
	IV	FL	9661	Space research and technology	18.5T
		NC	9199	General government	1.0G
		SC	3731	Ship building and repairing	2.0T
	V	OH	7391	Research and development laboratories	5.0G
		WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	110.0G
			2869/2843/ 2899/2841	Industrial organic chemicals/ surface active agents/chemical preparations/soap and other detergents	26.0G
	VI	LA	2869/2819	Industrial organic chemicals/ industrial inorganic chemicals	4.0T
		TX	8062/8071	General medical and surgical hospitals/medical laboratories	28.0P
	VIII	CO	9711/3499	National security/fabricated metal products	1.0G
		CO	3761/3764/ 7391/3769	Guided missiles and space vehicles/ space propulsion units and parts/ research and development laboratories/space vehicle equipment	22.0T
	IX	CA	3679/9661/ 2999	Electronic components/space research and technology/ petroleum and coal products	1.0T
	X	WA	9711/3731	National security/ship building	1.0T
			9711/8922/ 4911/1541	National security/noncommercial research organizations/electric services/industrial buildings and warehouses	446.0P

Table E-3 (Continued)

Waste code	EPA Region	State	SIC codes	Industry	Volume
U134-hydrogen fluoride	IX	CA	3629/3832 3671/3693	Electrical industrial apparatus/ Optical instruments and lenses/ electron tubes, receiving type X-ray apparatus and tubes	4100G
			3999	Manufacturing industries	57T/3500G
			3674	Semiconductors and related devices	527T
	III	DE	2800	General chemical manufacturing	8.0P
	V	IN	3674/3651/ 3471/3469	Semiconductors and related devices/radio and TV receiving sets/electron tubes, receiving type/metal stampings	44670T
	I	MA	4226/4959 2899	Special warehousing and storage/ Sanitary services/chemical preparations	55G
	V	MN	2821/2641/ 3861/2851	Plastics, materials and resins/ paper coating and glazing/ photographic equipment and Supplies/paints and allied products	1265G
	VIII	MT	2911	Petroleum refining	3.0T
	V	OH	9711/3721 7391	National security/aircraft research and development laboratories	1.0T 1.0G
			3229/3471	Pressed and blown glass/ Plating and polishing	4,800,00G
			3641	Electric lamps	1.0P
	III	PA	2819/2873 2869	Adhesives and sealants/ Nitrogenous fertilizers Industrial organic chemicals	55.0G
U134-hydrogen fluoride	VI	TX	2869/2821 2899	Industrial organic chemicals/ plastics, materials and resins/ Chemical preparations	15.0G
	X	WA	9711/8922 4911/1541	National security/noncommercial research organizations/electric services/industrial buildings and warehouses	67.0P
	V	WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G

Table E-3 (Continued)

Waste code	EPA Region	State	SIC codes	Industry	Volume
U135-Hydrogen sulfide	I	MA	3861	Photographic equipment and supplies	1500.0G
	III	DE	2800	General chemical manufacturing	
	IV	SC	3751/9711	Motorcycles, bicycles, and parts/ national security	2.0T
	V	WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
	IX	CA	2911	Petroleum refining	1.0T
U160-Methyl Ethyl ketone peroxide	II	NJ	2834	Pharmaceutical preparations	1320.0G
		NY	2869	Industrial organic chemicals	17.0T
	IV	FL	9661	Space research and technology	1.0T
		SC	3731/9711	Ship building and repairing/ national security	1.0T
	V	WI	2800/2869	General chemical manufacturing/ industrial organic chemicals	1.0G
	VI	LA	3764/3471/ 3499/3479	Space propulsion units and parts/ plating and polishing/fabricated metal products/metal coating and allied services	1.0T
	IX	CA	2869	Industrial organic chemicals	1.5T
	X	WA	9711/3731	National security/ship building and repairing	4.0G
U186-1,3-Pentadiene					
U189-Phosphorus sulfide	V	IL	2869/2818/ 2819	Industrial organic chemicals/ organic pesticide products/ industrial inorganic chemicals	90.0T
	VI	TX	2869/2821/ 2899	Industrial organic chemicals/ plastics, materials, and resins/ chemical preparations	1.0G
	VII	MO	2879/2818	Agricultural chemicals/organic pesticides products	3.0T
	X	WA	3721	Aircraft	1.0T
U249-Zinc phosphide (<10%)	IX	CA	9199/2899	General government/chemical preparations	1.0T

G = gallons
P = pounds
T = tons

Note: The default unit for the survey is tons.

Reference: USEPA 1986.

Table E-4 Analytical Problems Associated with the Listing Constituents for Reactive P and U Waste Codes

Chemical	CAS no.	Reasons for analytical problems
P006 - Aluminum phosphide	20859738	5
P009 - Ammonium picrate	131748	3
P056 - Fluorine	7782414	5
P068 - Methyl hydrazine	60344	5
P073 - Nickel carbonyl	13463393	5
P081 - Nitroglycerine	55630	2
P087 - Osmium tetroxide	20816120	1
P096 - Phosphine	7803512	3
P105 - Sodium azide	26628228	3
P107 - Strontium sulfide	1314961	1
P112 - Tetranitromethane	509148	5
P122 - Zinc phosphide (>10%)	1314847	5
U023 - Benzotrichloride	98077	5
U086 - 1,2-Diethylhydrazine	1615801	4
U096 - a,a-Dimethylbenzyhydroperoxide	80159	3
U098 - 1,1-Dimethylhydrazine	57147	5
U099 - 1,2-Dimethylhydrazine	540738	5
U103 - Dimethyl sulfate	77781	5
U133 - Hydrazine	302012	3
U134 - Hydrogen fluoride	7664393	5
U135 - Hydrogen sulfide	7783064	5
U160 - Methyl ethyl ketone peroxide	1338234	5
U186 - 1,3-pentadiene	504609	3
U189 - Phosphoric sulfide	1314803	2
U249 - Zinc phosphide (<10%)	1314847	5

1. This constituent can be analyzed for the metal but not the inorganic compounds. It is the compound that gives the waste its reactive characteristic; therefore, EPA believes that a numerical standard based on metal content of the residuals may not control the reactive characteristic of the waste.

2. Only high performance liquid chromatography (HPLC) techniques have been identified for analysis of this constituent. This method, SW-864 Method 8310, is used to determine the concentration of certain polynuclear aromatic hydrocarbons (PAHs) in ground water and wastes. Use of this method presupposes a high expectation of finding the specific compounds of interest; if this method is used to screen samples for any or all of the applicable PAHs listed under the method, the analyst must develop protocols to verify the identity of those constituents. This inability to positively identify chemicals in a complex matrix is typical of methods that employ HPLC and limits the usefulness of such methods when analyzing complex samples containing unknown constituents.

3. The Agency knows of no methods that are available for analysis of this constituent.

4. Standards are not readily available for this constituent. Analytical standards are chemical compounds of guaranteed purity that can be used for calibrating instruments and checking the accuracy of the data. The Agency considers analytical standards for a constituent to be commercially unavailable if no chemical manufacturer or other supply sources will sell reasonably pure samples of that constituent to analytical laboratories. Without using a standard for a particular constituent, the analyst cannot ascertain that the analytical results for that constituent are reproducible. If the results are not reliable and reproducible, the ensuing numerical treatment standards are fallible and unenforceable.

5. This constituent decomposes in or reacts with water. When placed in water, some constituents separate into ions, while others decompose or react with the water. Such constituents are considered unstable in water. This instability inhibits or even prevents the direct measure of a constituent's concentration in aqueous wastes, treatment residues, and leaching solutions from such wastes.

Reference: Alchowiak 1989.

APPENDIX F

CARBON ADSORPTION PERFORMANCE DATA

The purpose of this appendix is to discuss the applicability of carbon adsorption to wastewaters containing reactive listing constituents. The discussion is subdivided by waste type so that the reader can readily understand the types of reactive wastes to which this technology is applicable.

Carbon adsorption is generally applicable to organic compounds containing one or more polar groups. The following are the major classes of compounds for which applicability can be readily established (Hutton 1981). Table F-1 shows the amenability of typical organic compounds to activated carbon adsorption.

1. Amines and Aminic-Like Compounds

A considerable volume of information exists on the removal of ammonia and amines from wastewaters. Reactive constituents containing amino (NH_2, NH or N) groups should behave similarly to the amines already studied, such as dipropylamine and aniline. Compounds containing NH_2, NH, or N groups among the reactive wastes are as follows:

- Methyl hydrazine (P068)
- N N diethyl hydrazine (U086)
- 1,1 diethyl hydrazine (U098)
- 1,2 diethyl hydrazine (U099)
- 1,2 diphenyl hydrazine (U109)
- Hydrazine (U133)

For aromatic hydrazines, comparisons should be made with aniline. Di-n-propylamine should be used as a surrogate or the alkylamines and ammonia should be used as a surrogate for free hydrazine.

2. Nitrated Compounds

A very large volume of information exists on the removal of nitrated phenols, aromatics, and aliphates from wastewater using activated carbon. Compounds containing nitro groups, which are reactive waste constituents, are as follows:

- Ammonium picrate (P009), which is ammonium salt or trinitrophenol (the dinitrophenols have been extensively studied)
- Tetranitromethane (P112)

Nitrate esters (i.e., nitroglycerin (P081)) are known to be treatable by carbon adsorption. The listed waste, K045, is spent carbon for treatment of wastewaters from production of nitrate ester and other nitrated explosives.

3. Other Polar Compounds

Acid, ester, ketone, and alcohol compounds removed from wastewater using activated carbon have been studied extensively (Belfort 1981). The following reactive wastes fit into one or more of these compound classes:

- Dimethyl sulfate (U103) is an ester.
- Dimethyl benzyl hydroperoxide (U096) and methyl ethyl ketone peroxide (U160) are both organo peroxides, which are structurally similar to alcohols.

Table F-1 Amenability of Typical Organic Compounds to Activated Carbon Adsorption

Compound	Molecular weight	Aqueous solubility	Concentration		Adsorbability	
			Initial (C_o)	Final (C_s)	g Compound/ g Carbon	Percent reduction
Alcohols						
Methanol	32.0	--	1,000	964	0.007	3.6
Ethanol	46.1	--	1,000	901	0.020	10.0
Propanol	60.1	--	1,000	811	0.038	18.9
Butanol	74.1	7.7	1,000	466	0.107	53.4
n-Amyl alcohol	88.2	1.7	1,000	282	0.155	71.8
n-Hexanol	102.2	0.58	1,000	45	0.191	95.5
Isopropanol	60.1	--	1,000	874	0.025	12.6
Allyl alcohol	58.1	--	1,010	789	0.024	21.9
Isobutanol	74.1	8.5	1,000	581	0.084	41.9
t-Butanol	74.1	--	1,000	705	0.059	29.5
2-Ethyl butanol	102.2	0.43	1,000	145	0.170	85.5
2-Ethyl hexanol	130.2	0.07	700	10	0.138	98.5
Amines						
Di-N-Propylamine	101.2	--	1,000	198	0.174	80.2
Butylamine	73.1	--	1,000	480	0.103	52.0
Di-N-Butylamine	129.3	--	1,000	130	0.174	87.0
Allylamine	57.1	--	1,000	686	0.063	31.4
Ethylenediamine	60.1	--	1,000	893	0.021	10.7
Diethylenetriamine	103.2	--	1,000	706	0.062	29.4
Diethanolamine	105.3	95.4	996	722	0.057	27.5
Triethanolamine	149.1	--	1,000	670	0.067	33.0
Monoisopropanolamine	75.1	--	1,000	800	0.040	20.0
Diisopropanolamine	133.2	87	1,000	543	0.091	45.7
Aromatics						
Benzene	78.1	0.07	416	21	0.080	95.0
Toluene	92.1	0.047	317	66	0.050	79.2
Ethyl benzene	106.2	0.02	115	18	0.019	84.3
Phenol	94	6.7	1,000	194	0.161	80.6
Hydroquinone	110.1	6.0	1,000	167	0.167	83.3
Aniline	93.1	3.4	1,000	251	0.150	74.9
Styrene	104.2	0.03	180	18	0.028	-88.8
Nitrobenzene	123.1	0.19	1,023	44	0.196	95.6

Table F-1 (continued)

Compound	Molecular weight	Aqueous Solubility	Concentration		Adsorbability	
			Initial (C_o)	Final (C_s)	g Compound/ g Carbon	Percent reduction
Esters						
Methyl acetate	74.1	31.9	1,030	760	0.054	26.2
Ethyl acetate	88.1	8.7	1,000	495	0.100	50.5
Propyl acetate	102.1	2	1,000	248	0.149	75.2
Butyl acetate	116.2	0.68	1,000	154	0.169	84.6
Primary amyl acetate	130.2	0.2	985	119	0.175	88.0
Isopropyl acetate	102.1	2.9	1,000	319	0.137	68.1
Isobutyl acetate	116.2	0.63	1,000	180	0.164	82.0
Vinyl acetate						
Ethylene glycol mono-ehtyl ether acetate	132.2	22.9	1,000	342	0.132	65.8
Ethyl acrylate	100.1	2.0	1,015	226	0.157	77.7
Butyl acrylate	128.2	0.2	1,000	43	0.193	95.9
Ketones						
Acetone	58.1	--	1,000	782	0.043	21.8
Methyl ethyl ketone	72.1	26.8	1,000	532	0.094	46.8
Methyl propyl ketone	86.1	4.3	1,000	305	0.139	69.5
Methyl butyl ketone	100.2	v.sl.sol.	988	191	0.159	80.7
Methyl isobutyl ketone	100.2	1.9	1,000	152	0.169	84.8
Methyl isoamyl ketone	114.2	0.54	986	146	0.169	85.2
Diisobutyl ketone	142.2	0.05	300	nil	0.060	100.0
Cyclohexanone	98.2	2.5	1,000	332	0.134	66.8
Acetophenone	120.1	0.55	1,000	28	0.194	97.2
Isophorone	138.2	1.2	1,000	34	0.193	96.6
Organic Acids						
Formic acid	46.0	--	1,000	765	0.047	23.5
Acetic acid	60.1	--	1,000	760	0.048	24.0
Propionic acid	74.1	--	1,000	674	0.065	32.6
Butyric acid	88.1	--	1,000	405	0.119	59.5
Valeric acid	102.1	2.4	1,000	203	0.159	79.7
Caproic acid	116.2	1.1	1,000	30	0.194	97.0
Acrylic acid	72.1	--	1,000	355	0.129	64.5
Benzoic acid	122.1	0.29	1,000	89	0.183	91.1

Reference: Ginsti 1974.